SIGNAL/ONE 2200 Anvil Street North, St. Petersburg, Florida 33710 (813) 347-9091

A Division of ECI (An NCR Subsidiary)

INTERIM INFORMATION

Dear Customer:

Deliveries of early production radios have established that there are a few minor pit-falls to be avoided until such time as a final owner's manual can be provided. Perusal of the manual as provided can eliminate a good share of these; the tendency of the typical amateur radio operator to install and operate a complex piece of equipment without having read the manual is well known. A few words of caution before installation are entered on this sheet in the hope that it will call attention to particular errors frequently encountered.

First, the radio will not operate properly without installation of the auxiliary accessory plug. This plug, while intended to provide input/output connections for future accessories, does contain jumpers required for normal operation of the radio. When left disconnected, the symptoms are these: the frequency counter reads 900 on "A" VFO continuously, the RF gain control is inoperative and the meter functions do not work. Insertion of the auxiliary plug provided will cure this problem.

Secondly, several of the controls on the CX-7 are unique; no other radio offered to the amateur provides these features and they warrant some special attention. First, the OUTPUT control provides variable output from less than 1 watt to full output at the twist of a knob. No matter how loudly you talk to the unit, output will not be obtained unless the OUTPUT control is advanced from zero. Nominally, initial tune up should be effected by depression of the TUNE button (after at least 60 seconds of warm-up) with the output control reduced to zero. Advancing the output control until a forward power of 150 watts (about 4 on the meter) is obtained, or until no further increase in output is noticed with increase in rotation of the control, will provide full power output from the CX-7. Returning to the PUSH TO TALK or VOX position and speaking into the microphone, advancement of the clipping control will provide this same peak power out in the sideband mode.

Third, neither the band switch nor the Broadband-Manual switch may be operated while power output is present from the CX-7. Doing so can result in a burned up switch which is a time-consuming repair job and not covered by the warranty as this is abuse of the radio. To avoid any possibility of this happening, be sure the PTT function switch is depressed and the microphone not keyed before changing bands or selecting Broadband-Manual operation.

Auxiliary connections on the rear of the unit are provided to key an external amplifier or antenna change-over relay. This set of contacts, when used in the CW mode with a power amplifier, will key the power amplifier relays on each character, resulting in chattering. To prevent this, the TRANSMIT push-button parallels this set of contacts on the rear of the unit; when using the CX-7 to drive a power amplifier that does not have the capability for full break-in operation, the transmit button should be depressed prior to the start of a transmission and released at the end of a transmission in order to hold the amplifier relays closed during transmission. An external foot switch may also be connected to the microphone PTT terminals for this purpose.

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"It Speaks for Itself"

PRESS-IN FASTENERS FOR CHASSIS/CABINET ASSEMBLY: Those of you who have taken the CX7 out of its cabinet more than once or twice (and who hasen't?) have, I'm sure, found that the threads in the chassis bottom strip out and the 6:32 hardware will not snug up the cabinet to the chassis. The solution here is to provide press-in fasteners suitable for installation on the chassis. S/1 NEWS has available a package of 15 press-in fasteners which will do the trick nicely. Cost is $2.25. When ordering please include a SASE. The fasteners utilize 4:40 screws. This smaller size was necessary due to space limitations in the chassis for the fasteners. 4:40 hardware is readily available. Use 4:40 x 3/8 except for the two screws holding the rear feet where 4:40 x ½ is required. Install the fasteners as follows:

1. Remove the CX7 from its cabinet.
2. Carefully drill out each screw location in the bottom of the chassis to .166-inches. Make sure none of the metal chips from drilling ends up in the cabinet internals!. (By the way a number 19 drill bit is .166 inches)
3. Install each fastener by pressing it into the hole from the bottom side of the chassis lip. The fasteners can be started by using a 4:40 screw and the job finished using a small pair of vice-grips or C-clamp.
4. Reinstall the CX7 into the cabinet. Done.

ANOTHER RF DRIVER TRANSISTOR SUBSTITUTION (K3QHY). The HEPS3005 will replace the 2N5641 as a driver transistor. These are available from MHz Electronics, 2543 N. 32nd Street, Phoenix, Az., 85008. (602) 957 0786. (Cost is $9.55 according to one of their recent advertisments .. ed.)

RF SPIKES. A reminder by Bill, K2SIL (now K1GQ): The RF spike problem mentioned several times in S/1 NEWS, can be cured by replacing Q1 on the RF driver board, A5.

TRANSISTOR REPLACEMENT. Mark, K6BE, recommends the use of military/ industrial type transistors for higher reliability. For example:

MPS3702	2N2906
2N5183	2N2221
40673	3N187
40603	3N187
40604	3N187
40468A	3N128
MPSU05	2N2219A

FOR SALE

CX7B with LED readouts. Serial 046224361. In good condition. $1395. Contact Tony Sperduti, WB2MPZ, 4740 Newton Road, Hamburg, N.Y., 14075. (716) 649 7527.

INFO WANTED. Does anyone have any thoughts concerning a direct PTO replacement using varicaps and a nultiturn potentiometer or etc.? (by W6CPL)

NORTH
VA
220
APR
1971
VIRGINIA

SIGNAL/ONE 2200 Anvil Street North, St. Petersburg, Florida 33710 (813) 347-9091
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SIGNAL/ONE MODEL CX7

IMPORTANT INSTALLATION, ADJUSTMENT, AND OPERATING NOTES.....

It is extremely important that a few basic procedures and precautions be observed in order to derive from your new CX7 the high level of performance designed into it, as well as to avoid damage to the power amplifier. PLEASE READ THE FOLLOWING TWO PAGES CAREFULLY, as well as the applicable portions of the instruction manual, before operating.

USING THE CX7 WITH A SEPARATE LINEAR AMPLIFIER

SSB: The inherent transmit-receive switching speed of the CX7 is necessarily extremely fast in order to permit full CW break-in operation. Typical relays used in high powered amplifiers, however, require up to 10 milliseconds or more to close. During the closing period, an open-circuit load is reflected back to the CX7, resulting in very high momentary peak voltages which can damage the power amplifier or even the interconnecting coaxial cable fittings.

To avoid this problem in the CX7 during SSB (and AM) operation, a time delay of 10 milliseconds is introduced on the build-up of RF output after switching to "TRANSMIT" manually or by PTT or VOX operation. It is extremely important that the CX7 not be operated in the BROADBAND P.A. mode with a separate amplifier until it is determined that the amplifier's changeover relays complete closing within 10-12 ms. A monitor scope in the CX7 RF OUTPUT line will indicate existence of an excessively slow P.A. relay as follows: while feeding into the MIKE jack an audio tone sufficient to yield full transmitter output (or by whistling continuously into the mike), operate either the PTT switch on the mike or the CX7 manual TRANSMIT push-button. If the leading edge of the RF envelope appears smooth and slightly rounded, no problem exists. If a short "spike" appears, the amplifier relay is excessively slow and you should contact SIGNAL/ONE Customer Service for information on how to correct the problem.

CW: The CX7 operates full break-in on CW, with envelope rise and fall times on the order of 2-3 milliseconds. Any accompanying power amplifier must complete its internal relay closure within this period (which is generally impossible except for carefully selected vacuum-type relays), must be used with an electronic "T/R" switch, or must be manually switched before operating the key (as with a foot switch, for example).

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The clipping control acts as both a microphone gain control and an RF clipping control. Advancement of the control to approximately position 3 or 4 (or until the meter just kicks above zero when reading CLIPPING, results in full output with nominal 6 dB clipping, and will provide for some variation in gain between different microphones. Further advancement of the clipping control will cause the meter reading to rise higher on the scale, and approximately 20 dB of RF speech clipping is obtained, with a peak meter reading of S-6 to S-9.

When in the DRIVE position, as in the CLIPPING position, the meter is a threshold device; a peak reading of S-1 to S-3 are indicative of approximately 3 dB of RF compression (automatic load control). More drive than this is undesirable under any conditions and will not increase power output under proper operating conditions.

In the PLATE position, the meter reads 0 to 500 milliamperes of plate current. In the SCREEN position, it reads 0 to 50 ma screen current and in FORWARD and REFLECTED POWER positions, the meter becomes a directional wattmeter with a full scale sensitivity of 200 watts. Nominally a reading of 4 on the meter is equivalent to 150 watts.

Thank you for your attention to this interim sheet, most of the information provided here is contained elsewhere in the manual. Get to know your radio and I am certain you will derive many hours of operating pleasure from it.

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ADJUSTMENT OF "CLIPPING" AND "OUTPUT" CONTROLS

CLIPPING: With the OUTPUT control full CCW (minimum) and the CLIPPING meter button depressed, adjust the CLIPPING control until the meter just deflects off "0" on peaks while speaking in a normal voice. This set-up corresponds to approximately 5-10 db of RF clipping, which is appropriate for most operation under medium to strong signal conditions. To minimize background noise, it is highly desirable to use a good cardiod mike (such as the EV 664 or 674 or SHURE 545) and to close-talk it. Under difficult conditions, transmitting effectiveness may be enhanced by increasing the CLIPPING control until the meter swings to half scale on occasional peaks. The use of more clipping than is required under any given circuit conditions will increase audio distortion, rather than intelligibility, at the receiver. For any given microphone and operator's voice, the setting of the CLIPPING control is quite consistent and non-critical, so that the knob setting for various degrees of clipping may be once noted and then adjusted as required thereafter, without need to monitor the meter CLIPPING indication.

OUTPUT: With the CLIPPING control set for 5-10 db normal clipping as described above, the OUTPUT control should be advanced (with the DRIVE meter button depressed) until the meter just deflects off "0" on peaks. It should not swing higher than "1" on the upper meter scale under any conditions, and no benefit can ever be derived (except excessive background noise) by doing so. When EXTERNAL ALC is fed back from a separate power amplifier into the CX7, the OUTPUT control should be turned only to the point of slight meter deflection described above with the linear in operation.

METER INDICATIONS UNDER NORMAL CX7 OPERATION

TUNE CONDITIONS: To determine if load SWR is sufficiently low to permit safe and efficient BROADBAND operation of the CX7 P.A., depress REV PWR push button and slowly increase OUTPUT control until meter indicates S-3 or fails to increase further with increased OUTPUT setting. Push FWD PWR button. If meter reads S-9 or greater (for REV PWR at or below S-3), BROADBAND operation will not damage the CX7. NEVER OPERATE THE CX7 IN THE BROADBAND P.A. POSITION IF THE RATIO OF FWD PWR READING TO REV PWR READING IS LESS THAN 3:1!

At full power output in TUNE, normal meter readings are:

CLIPPING: 0. (Deflects in 0 to S-9 range on peaks when transmitting voice, depending on CLIPPING setting).
DRIVE: 0 to S-3 (S-1 maximum on voice peaks).
PLATE: 2 to 3 (upper scale). (1.5 - 2.0 on voice peaks).
SCREEN: 0.5 to 2.0 (upper scale). (0 to 1.0 on voice peaks).
FWD PWR and REV PWR: See preceding paragraph.

BASIC CONTROL SET UP

Control	Setting
BroadBand/Manual	Manual
PA Tuning	7-8
Loading	6-7
Keyer	Min
Spot Level	1/4 Range
Calibrate	In
FSK	Min
Preselector	1-2
Clipping	3
Output	0
AGC	Slow
Meter	Plate
Transmit VFO	A
Control	PTT
Receive Channel	A
IF Shift	0
Blanker	Off
RF Gain	10
Audio Gain	3
Mode	USB
AUX Ant Switch	Common
AC	On

With these control settings and an antenna attached 20 meter signals will be heard when VFO a is tuned through the proper range 14.00 to 14.35.

To transmit depress the tune button and advance the output control for a plate current reading of about 200 Ma. Tune the CX-7 as you would any other transmitter. Always check the screen current; it should never exceed 1 on the black scale. Into a good antenna 0 or negative screen current is not uncommon in the tune up process. The CX-7 output tunes very sharp so always recheck tuning after an adjustment to the output control or a drastic change in frequency.

It is also very important that the output control only be advanced until power stops increasing. Advancing the output control further than necessary will degrade rather than improve performance.

After tuning up manually, if the reflected power is below 2 to 1, use the broadband position - do not switch the broadband manual switch with the CX-7 keyed.

In broadband, again, only advance the output control until the power stops increasing.

1 — E1f A10-10

2 — S1A-3

3 — S1A-1

4 — T2-5

5 — T2-7

6 — E11

7 — F1-1

8 — E2c T1-19

9 — TB1-20

10 — A3-122

11 — A2-52

12 — A3-132

13 — A5-251

14 — E19

J5-P5

4, 5 } 600-52

IMPORTANT
READ BEFORE OPERATING

CONGRATULATIONS:

You have just acquired the most sophisticated piece of electronic communications equipment ever offered for use in ham radio.

We've never claimed that the CX7 "DELUXE INTEGRATED STATION" is a simple piece of equipment. It's complex, and like any complex unit it can deliver the maximum performance designed into it only when properly used.

PLEASE STUDY THE INSTRUCTION MANUAL BEFORE APPLYING POWER TO YOUR CX7!

The CX7 is exceptionally rugged, but it is also a fine instrument and should not be abused unnecessarily. Should you by any chance experience difficulty in interpreting instructions in the manual or in securing normal performance from your CX7, we hope that you will contact the factory directly for advice or clarification. We are located in St. Petersburg, Florida area code 813/347-9091.

To assure your protection under SIGNAL/ONE's outstanding warranty, be sure to immediately fill in and mail the warranty registration card. We hope you won't require warranty service, but if you do both the SIGNAL/ONE factory repair department and our authorized distributors stand ready to serve you.

We are sure you will get a great deal of pleasure out of your new CX7, and we'll be most happy to receive your comments after you have had the opportunity to become familiar with it.

signal/one

P.O. Box 127
Franklin Lakes, N.J. 07417
201-891-0459

INSTRUCTION FOR THE REPLACEMENT OF THE CX7/CX7-A POWER SUPPLY BOARD

Gathering data from firsthand experience, more than 75 percent of the failures both in the factory and in field use have been associated with the Power Supply Board.

This replacement board will provide short circuit and thermo overload protection on all low voltage power supplies in the CX-7.

1. Remove the outside dust cover from the radio.

2. Place the radio so that power supply board will be at your upper right (on left end).

3. Remove the four mounting screws holding the board to the standoffs.

4. With care so as not to damage the leads and the push-on "Amp solderless terminals" move the board as required to gain access for the following steps.

5. Locate and remove the +34 volt Filter Capacitor C-2 mounted on the main chassis. This is a 2,000 microfarad/75 volt electrolytic. In the event the outside case is not insulated, wrap with tape prior to reinstallation. Remove and discard the non-insulated mounting washer. Mount the provided insulated washer and reinstall the capacitor on the main chassis.

6. Connect a 9-inch long lead to an outside can terminal. (The other end to be connected later.)

7. Reconnect the leads to the positive terminal of C-2.

8. Solder the provided 5K 2-watt resistor between the plus terminal and an outside can terminal (now above chassis grd.) (Verify all leads on C-2 are now soldered.)

9. Located on the radio rear panel, remove Q4 (the tip 29 with the orange lead) and replace the leads pin for pin with the

Note: Under Q1, Q3 & Q4, use white heat-sink ~~heat-sink~~ compound supplied.

(Cont'd)

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2N6101 provided. Insulate the mounting tab (collector) with existing hardware and install at lower rear of back chassis panel.

10. As in Step 9, remove Q1 (the tip 29 with the re ‹ lead) and replace wire for wire with the provided MC7815. Do not insulate the mounting tab.

11. As in Step 9, remove Q3 (the tip 29 with the brown lead) and replace pin for pin with the MC7805. Do not insulate the mounting tab.

12. Remove Q2 (the tip 30 with the blue lead.) Do not replace, clip and cover the three leads with sleeving or tape.

13. Wire jumpers on the new board as desired for either 117 or 230 volts. Pins 163, 164, 165 and 166.

14. Un-solder the transformer primary leads, (preferably one at a time) from the old board and connect and solder to the new board (same pins as in Step 13.)

15. Carefully disconnect all amp connectors and remaining solder connections and remove old board.

16. Identify the 34V supply transformer secondary center-tap soldered to a ground lug on the main chassis. This lead is of various color-coding depending on the power transformer installed in the radio. This lead can be traced by checking continuity to the leads normally connected to Pins 128 and 129 on the power supply board. Solder an 8-inch lead extension to the center-tap wire and place sleeving over splice. This extension and the 9-inch can lead from C-2 are to be soldered to the new pin called out as transformer center-tap.

17. Place the new power supply board in position and connect the amp connectors on the new board as shown. USE CAUTION -- The direct interchangeability of the board generates gap pins not used along the rear panel. Do not inadvertently fail to skip unused amp connectors. Carefully solder the high-voltage wiring to Pin 162 and the low voltage transformer secondary to Pins 146 and 153.

(Cont'd)

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18. Screw down the new power supply board to the 4 mounting stand-offs, carefully dressing leads and relieving any tension in the vicinity of the antenna change-over relay/high voltage rectifiers.

19. With an Ohmeter check continuity between the mounting screw of the 2N6101 to the rear panel -- should be more than 200 ohms.

20. Very carefully re-check all wiring and ascertain that all amp connectors are firmly seated.

21. Test for continuity between mounting screws on MC7805 and MC7815. Resistance should be less than 1 ohm.

22. Check for any solder splashes and loose hardware. Connect speaker and dummy load or antenna.

23. Apply power to the radio and perform the following voltage measurements in the receive mode.

Pins 101 - 105	= Approx. 0 volts
Pins 106 - 110	= -15 volts
Pins 111 - 115	= +15 volts
Pins 118 - 122	= -15 volts
Pin 127	= +38 to +40 volts
Pin 136	= +5 volts
*Pin 152	= +300 volts
Pin 117	= - 60 volts
*Pin 162	= +1600 volts

* EXTREME CAUTION

24. The radio should now be in an operational condition. Check for normal receive and transmit functions and replace unit in CX-7 dust cover.

(Cont'd)

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ADDITIONAL DATA

The regulated +5, +15 and -15 are now thermally and electrically protected. Momentary short circuits and excessive temperature will not damage the components. The +34 volt supply is electrically protected by a silicon controlled rectifier crowbar circuit. In the event of a short or excessive current from this supply, the SCR will fire and reduce the voltage to approximately 3-4 volts. To reset the crowbar, remove power from the radio for 10 seconds or more, then re-apply. The crowbar will reset as soon as the charge on C-2 has dissipated. This Supply has been designed to handle 10 amps, but less than 1 amp is normally drawn. Although the equipment will not be damaged by extended operation in the crowbarred mode, it should be reset as soon as noticed.

Activation of the SCR crowbar system is easily detected by lack of receive audio and no RF output since the +34 volts is required for the product detector and Q3 and Q4 on the RF driver board.

This modification will materially improve the reliability and maintainability of your CX-7/CX-7A.

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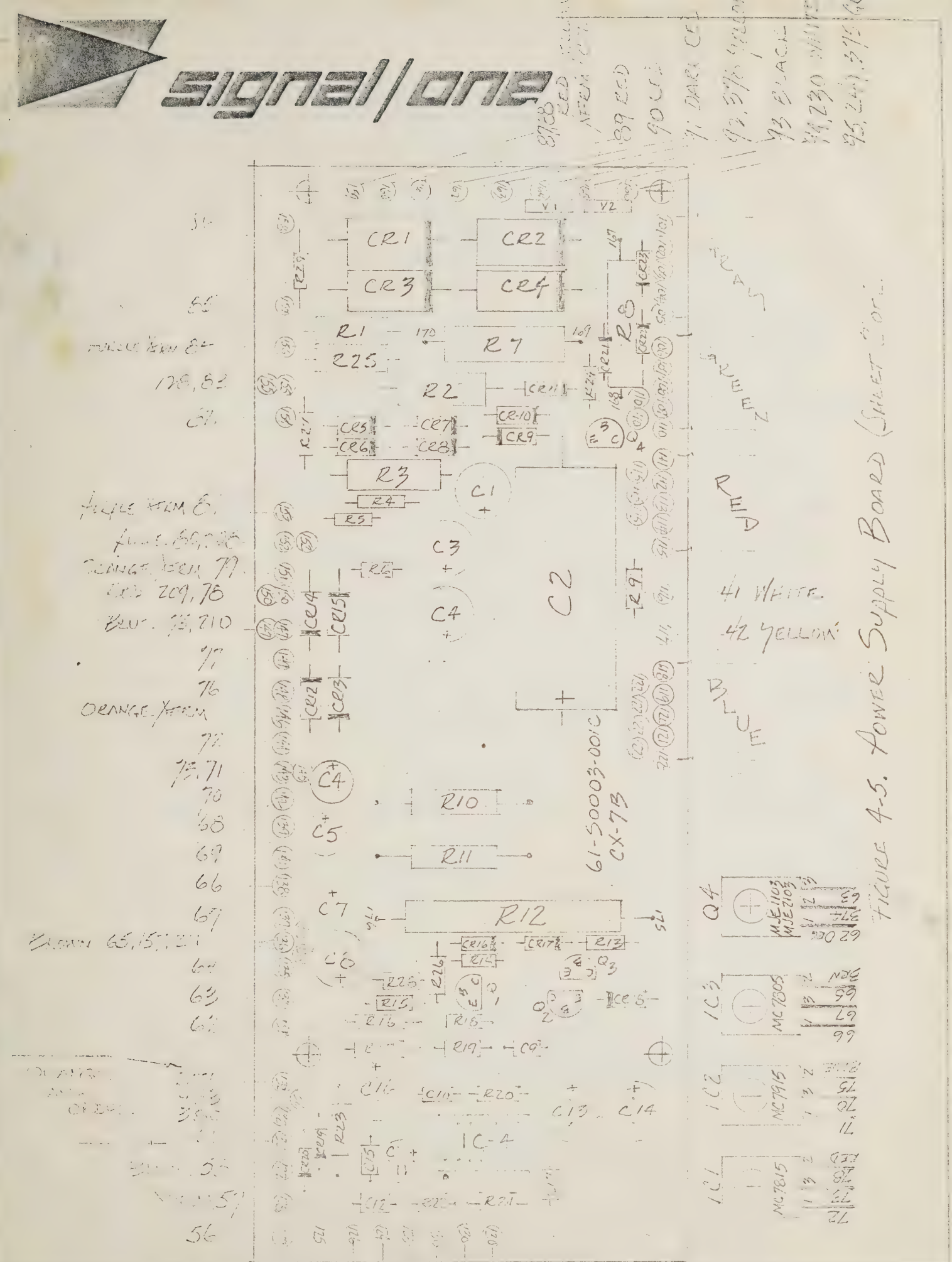

FIGURE 4-5. Power Supply Board (Sheet 2 of 2).

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INSTRUCTION FOR THE REPLACEMENT OF THE CX-7B POWER SUPPLY BOARD

Gathering data from firsthand experience, more than 75% of the failures both in the factory and in field use have been associated with the Power Supply Board.

This replacement board will provide short circuit and thermo overload protection on all low voltage power supplies in the CX-7.

1. Remove the outside dust cover from the radio.

2. Place the radio so that power supply board will be at your upper right (on left end).

3. Remove the four mounting screws holding the board to the standoffs.

4. With care so as not to damage the leads and the push-on "Amp solderless terminals" move the board as required to gain access for the following steps.

5. Located on the radio rear panel, remove Q1 (the tip 29 with the red lead) and replace wire for wire with the provided MC7815. Do not insulate the mounting tab, but use thermal compound provided.

6. As in Step 5, remove Q2 (the tip 30 with the blue lead) and replace pin for pin with the MC7915. Insulate the mounting tab with existing hardware and install in the rear back panel of the chassis with thermal compound provided.

7. As in Step 5, remove Q3 (the tip 29 with the brown lead) and replace pin for pin with the MC7805. Do not insulate the mounting tab, but use thermal compound provided.

8. As in Step 5, remove Q4 (the tip 29 with the orange lead) and replace the leads in the following order:
   Orange Wire No. 62 to Pin 1 (Base)
   Wire No. 374 to Pin 2 (Collector)
   Wire No. 63 to Pin 3 (Emitter)
   with the MJE1103 provided. Insulate the mounting tab (collector) with existing hardware and install atlower rear of back chassis panel with thermal compound provided.

9. Wire jumpers on the new board as desired for either 117 or 230 volts. Pins 163, 164, 165 and 166. Circuit boards are furnished wired for 117.

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INSTRUCTIONS - CX-7B POWER SUPPLY BOARD (cont'd)

10. Un-solder the transformer primary leads (preferably one at a time) from the old board and connect and solder to the new board (same pins as in Step 9).

11. Carefully disconnect all amp connectors and remaining solder connections and remove old board.

12. Place the new power supply board in position and connect the amp connectors on the new board as shown. USE CAUTION -- the direct interchangeability of the board generates gap pins not used along the real panel. Do not inadvertently fail to skip unused amp connectors. Carefully solder the high-voltage wiring to Pin 162 and the low voltage transformer secondary to Pins 146 and 153.

13. Screw down the new power supply board to the 4 mounting standoffs, carefully dressing leads and relieving any tension in the vicinity of the antenna change-over relay/high voltage rectifiers.

14. With an Ohmeter check continuity between the mounting screw of the MJE1103 to the rear panel -- should be infinity ohms.

15. With an Ohmeter check continuity between the mounting screw of the MC7915 to the rear panel -- should be more than 1000 ohms.

16. Test for continuity between mounting screws on MC7805 and MC7815. Resistance should be less than 1 ohm.

17. Very carefully re-check all wiring and ascertain that all amp connectors are firmly seated.

18. Check for any solder splashes and loose hardware. Connect speaker and dummy load or antenna.

19. Apply power to the radio and perform the following voltage measurements in the receive mode.

Pins 101 - 105 = Approx. 0 volts
Pins 106 - 110 = -15 volts
Pins 111 - 115 = +15 volts
Pins 118 - 122 = -15 volts
Pin 127 = +38 to +40 volts
Pin 136 = +5 volts
* Pin 152 = +300 volts
Pin 117 = -60 volts
* Pin 162 = +1600 volts

* EXTREME CAUTION

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INSTRUCTIONS - CX-7B POWER SUPPLY BOARD (cont'd)

20. The radio should now be in an operational condition. Check for normal receive and transmit functions and replace unit in CX-7 dust cover.

ADDITIONAL DATA

The regulated +5, +15 and -15 are now thermally and electrically protected. Momentary short circuits causing excessive temperature will not damage the power supply. The +5, +15 and -15 supplies are now current limited to 1 Amp. The +34 volt supply is electrically protected by a current fold back circuit. In the event of excessive current draw (approximately 1 Amp), the+34 volt supply will fold back to a safe level.

This modification will materially improve the reliability and maintainability of your CX-7/CX-7A

NOTE: All transistors and diodes are now in Berg gold-plated plug-in sockets and no attempt should be made to unsolder a device. A gentle upward pull will remove it should replacement ever be necessary.

ADDITIONAL CIRCUIT CHANGES TO BE MADE IN AUDIO BOARD A-6:

Install jumper wire in place of R65 and R66 12Ω 1/2 Watt resistors and remove Q16 and Q17 and in its place install MPS U05 carefully observing emitter base collector marked on U05 package in place of 2N5183.

NOTE: Careful lead orientation location of these transistors is very important as the devices will be destroyed if they are installed in the wrong order. The purpose of this modification is to increase the reliability of the Schmitt trigger circuit and to reinstate the RTTR key line at a true ground and -15 volt potential eliminating various PTO frequency shift problems displayed on the counter readout as experienced in the past.

OPTIONAL CIRCUIT CHANGES CAN BE MADE TO INCREASE AUDIO OUTPUT AS FOLLOWS:

Break wire 198 to J1 phone to Pin 1 J1 phone jack.
Connect wire from Pin 1 J1 to power supply board Pin 130.
Route new wire along existing wiring harness.

SIGNAL ONE

TROUBLE GUIDE

R. SULLIVAN
WØYVA/4

$2.70

NUMBER 5, REV 2a
SEPTEMBER 1975

CONTENTS

PREFACE

INTRODUCTION

TRANSMITTER SECTION PROBLEMS

RECEIVER SECTION PROBLEMS

OTHER PROBLEMS

MODIFICATIONS

MISCELLANEOUS INFORMATION

PREFACE

The following is a compilation of problems and their solutions applicable to the SIGNAL/ONE CX7 and CX7A transceivers. This transceiver is a complicated piece of equipment and as such requires close attention. This booklet is designed to focus attention on problems that have been common to the CX7 and CX7A transceivers and help their owners keep their units in proper operating condition.

The problems (and solutions) are from my own experiences and those of other owners. In most cases it is assumed that the reader will have in his possession a copy of the complete maintenance manual. It is suggested that repairs not be attempted if this manual is not available.

I with to thank all those who sent me information regarding their problems and how they solved them. For those of you who sent me problems and no solutions, I hope this booklet will be of help!

I intend to update this booklet from time to time.

Robert A. Sullivan
WØYVA/4

POB 6216, Shirlington Stn
Arlington, Virginia,22206

INTRODUCTION

The following sections will describe various Signal/One problems and their solutions. Remember of course that many times a problem has different solutions! The solutions herein are those of an actual experience of one or more owners. In other words, for some specific problem you may have the solution given here may not solve the problem but would certainly give direction to your troubleshooting!

It is strongly recommended that major repairs not be attempted without the complete maintenance manual at one's disposal.

Normal precautions when troubleshooting transistorized equipment should be observed at all times:

1. Be very careful not to short anything when probing with test leads - a short (for even a brief period) in the wrong place can damage many components!

2. If parts replacement is required be sure the part is an exact replacement or a recommended substitute. See the NOTE at the end of this section.

3. When desoldering and soldering on the printed circuit boards, do not use an iron with a rating greater than 50 watts. Lands will lift from the boards if an iron of higher rating is used.

4. In general voltage measurements should be made with a VTVM rather than a VOM to reduce circuit loading that can disguise proper readings. Keep in mind that some of the new FET type VOM's can not be used to check diodes or transistor junctions by comparing front and back resistances since not enough current is utilized to take the junction beyond its "knee". Check the instruction manual for your instrument.

5. Remove a component as a last resort! Carefully check voltages, resistances, etc. Many adjustments in the Signal/One are critical - make sure all associated adjustments are correct.

****

Many "problems" with the Signal/One can be traced to incorrect front and rear panel adjustments, tune up procedure, and misinterpretation of panel indications. Make sure you have carefully read and understand the operating instructions. This transceiver is NOT a KWM-2 which will operate properly under just about any conditions and/or misadjustments. Make sure you follow the procedures given in the manual. Read the following general comments carefully:

1. The OUTPUT control should never be advanced beyond 10 o'clock. Beyond this point most units will "take off" and cause spurious oscillations. This condition is indicated by very high forward and reverse power indications. With the DRIVE control at or near 9 o'clock output will be nearly 150 watts. This can be confirmed by inserting a tone at the mike jack. (In TUNE indicated power will be a little less)

2. NEVER attempt operation in the broadband mode with SWR's greater than 2:1. The broadband trimmers cannot take it. Remember that the broadband adjustments are made at a certain frequency and wide excursions from this frequency will require tune up in the NORMAL position.

3. If the BLANKER control is set too high severe distortion will result on received signals.

4. In some cases during normal operation, very little or no movement of the meter selected to DRIVE will be apparent. There is no need for concern here.

5. It is normal for the PRESELECTOR to peak at the extreme CCW end of this control except on 160 meters.

6. Do NOT use ALC when driving the A70 or A77 linears! (However, see the "modifications" section)

7. A key plugged into the KEY jack and depressed when in USB or LSB mode will cause a switch to the TRANSMIT mode but there will be no power output.

8. Many problems with the Signal/One can be traced to the Power Supply board and much information regarding possible modifications is floating around. The most desirable of these seems to be replacement of the discrete transistor regulator circuits with Integrated Circuit voltage regulators. The IC regulators are types MC7815 for the +15 volt supply, MC7915 for the -15 volt supply, and MC7805 for the +5 volt supply. The modification consists of removing most of the discrete power supply board transistors including the three transistors mounted to the rear of the chassis. See "S/1 NEWS" Volume I, Number 4 for additional details or write to Dick Cunningham, 1477 N. 96th Ave., Omaha, Neb., 68114 who can supply the complete modification.

The following sections are divided up as noted in the Table of Contents to help the reader get to the section covering his problem. I hope the information herein will be useful. I invite additional comments and suggestions.

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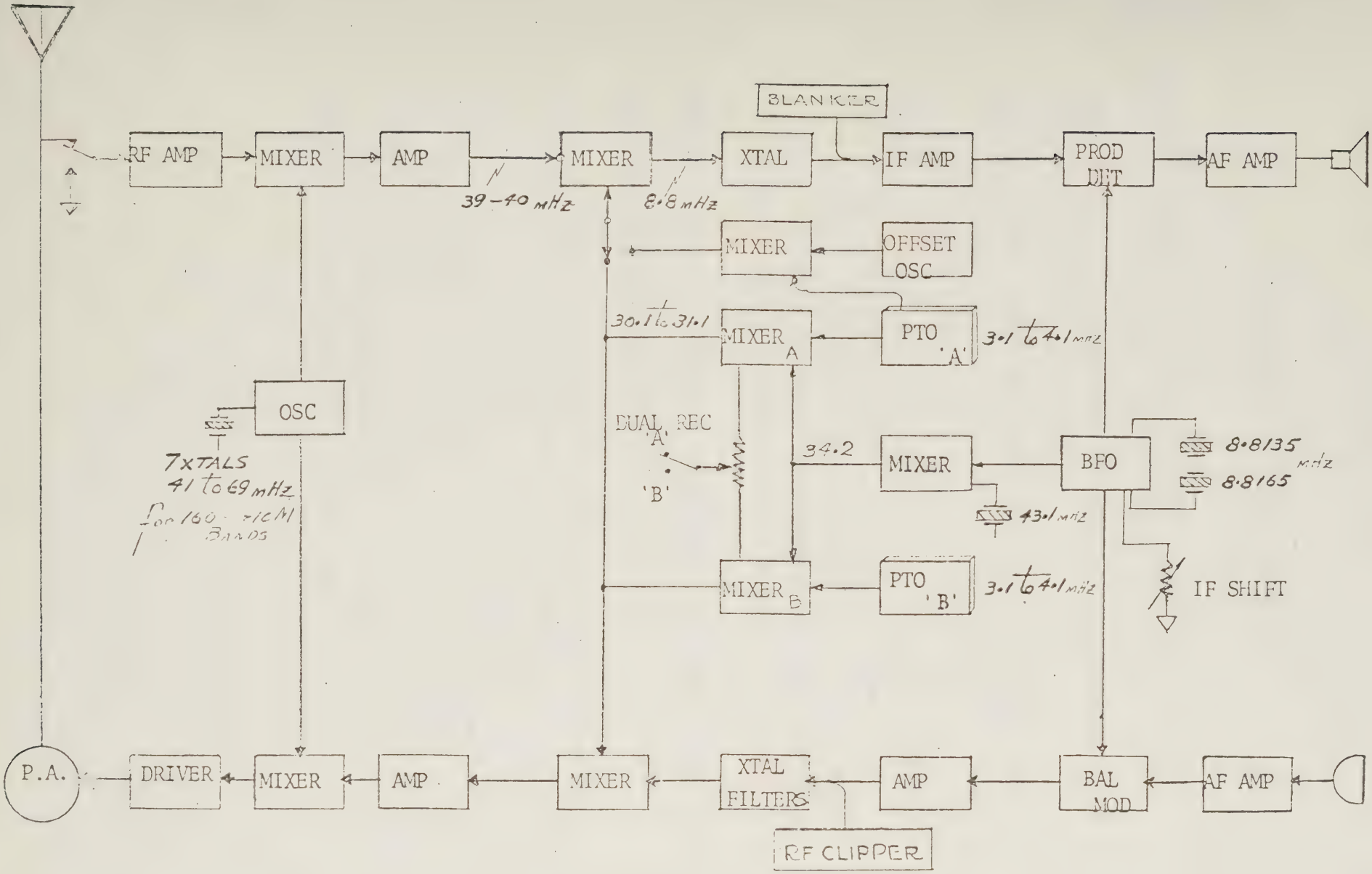


BLOCK DIAGRAM ~ signal/one

TRANSMITTER SECTION PROBLEMS

PROBLEM Apparent excessive power output on one or more bands (both forward and reverse).

CAUSE Driver section taking off on some parasitic frequency caused by overdrive.

SOLUTION Turn down the DRIVE control! You may not have 150 watts output in TUNE but if you whistle into the microphone or insert a tone you will find the output is very nearly 150 watts even with the DRIVE control as low as 9 o'clock. If turning down the DRIVE control does not solve the problem, replacement of one or more of the driver transistors may help (Q3 or Q4 on the RF driver board, A5).

PROBLEM Burned broadband capacitors in final cage

CAUSE Operation in broadband position with a high standing wave ratio.

SOLUTION Replace the burned capacitor(s). This can be a difficult job. In some cases, however, only the mica spacer that has burned can be replaced - which is an easier job than replacing the whole capacitor. This can be done by removing the adjusting screw and washer, bending the plates back until the burned spacer is located, and replacing that mica spacer. After replacement, readadjust the trimmer per the manual.

PROBLEM USB/LSB out of balance (that is, audio is normal in one sideband but distorted in the other)

CAUSE 8.8 Mhz carrier misadjusted.

SOLUTION Adjust R46 located on the BFO board, A4. ****

PROBLEM Spontaneous lock up to transmit mode in USB LSB, and CW positions. Keyer is inoperative.

CAUSE Defective transistor in keyer circuit

SOLUTION Check transistors associated with keyer on counter board, A7; especially Q3 (2N5183) (* SEE BELOW)

PROBLEM Transmitter tunes properly and shows proper RF output but no output when speaking into the microphone.

CAUSE Defective Q1 on audio board, A6.

SOLUTION Check to see if there is RF output when an audio signal is injected at the PHONE PATCH input. If signal is present, then Q1 is probably defective. Note that Q1 can be replaced without removing A6 by clipping the leads of Q1 above the board and soldering a new Q1 (2N5485) to the remaining leads.

* PROBLEM Lock up in transmit mode.

CAUSE Defective transistor on Audio Board, A6.

SOLUTION Check transistors Q16 and Q17 on audio board A6. Either of these transistors can cause the T/R line to lock in the transmit condition.

CAUSE Defective Integrated Circuit on Counter Board

SOLUTION Check the SN7420. Replace if necessary.

**** SEE NEXT PAGE

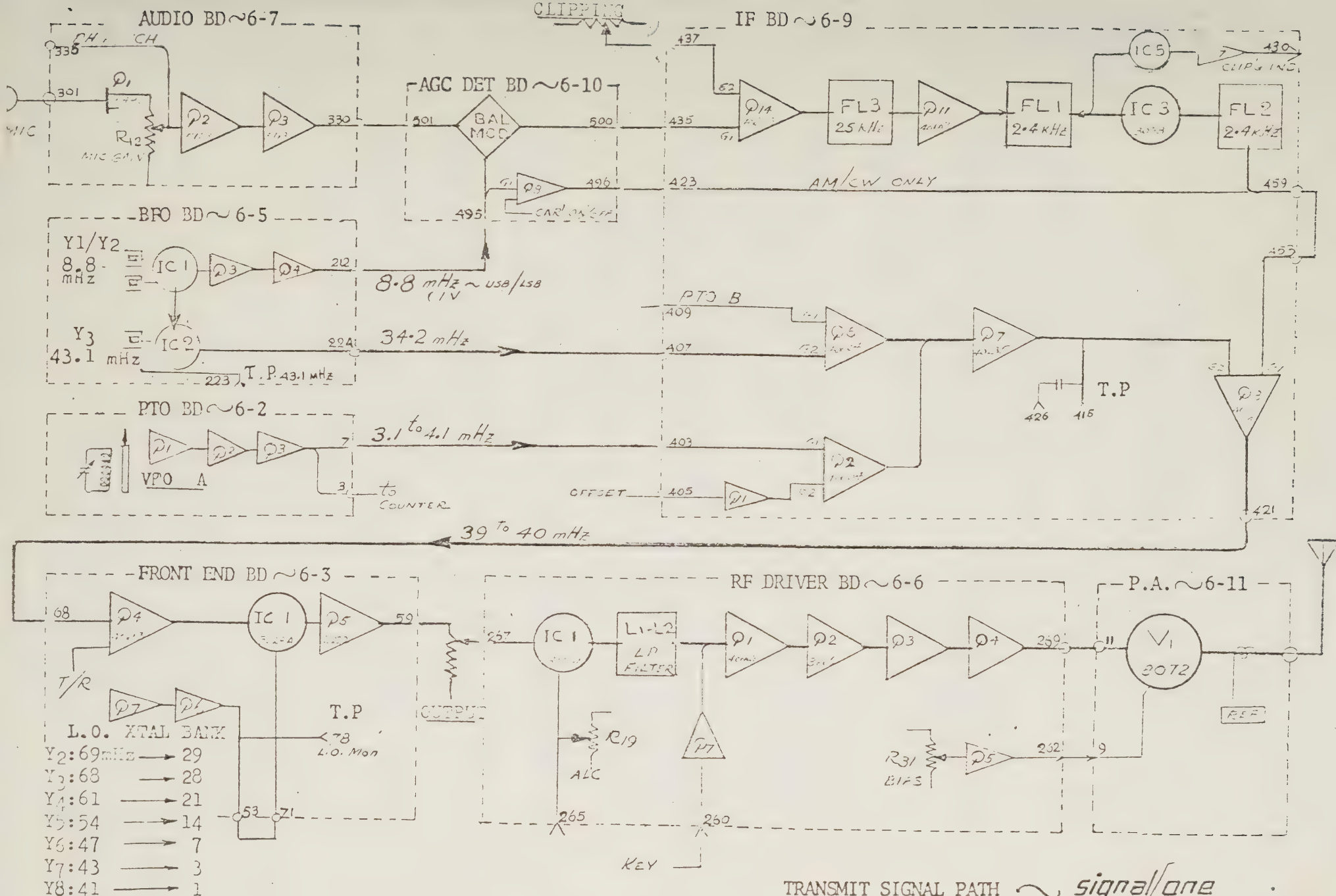
PROBLEM 8.8 Mhz carrier misadjusted. (R46 on BFO board, A4)

SOLUTION Adjust using one of the following methods;

1. Set the IF shift control such that switching from LSB to USB does not change the sound of speaker hiss. Adjust R46 such that depressing the SPOT button does NOT change the character of the hiss. The BFO will now be on the same frequency in transmit as in receive. (Excellent method for these without test equipment)

2. Remove unit from case, connect dummy load and set OUTPUT control to zero (full CCW). Turn audio gain up and switch between USB and LSB while adjusting the PASSBAND (IF shift) control for the same pitch from speaker. Feed some carrier oscillator signal into a BC221 FREQUENCY METER by picking up the signal from terminal #495 on board A9, the AGC/Detector board. Using headphones with the BC221, tune the BC221 to zero beat with the carrier oscillator (8.8165). Depress key or TRANSMIT button. If R46 needs adjustment the signal will no longer be zero beat in headphones. Adjust R46 for zero beat if necessary. (Exact method but requires the use of a BC221)

3. Adjustment by using counter in the CX7: Disconnect shielded line #5 to the counter board and connect to AGC board line #182 which is board pin #500. Set CARRIER OUTPUT to zero. Select TUNE. Ignore first digit of counter to read oscillator frequency. For example, when reading LSB crystal 8.8135, counter will read X135. Ignore the "X" digit. Make sure your 100Khz calibrator is zeroed with WWV. Refer to page 5-15 of Thomas manual for additional details.


AUDIO BD ~ 6-7
CLIPPING
IF BD ~ 6-9
AGC DET BD ~ 6-10
BAL MOD
FL3 25 kHz
FL1 2.4 kHz
FL2 2.4 kHz
IC5
IC3
AM/CW ONLY
CARRIER
BFO BD ~ 6-5
Y1/Y2 8.8 mHz
IC1
8.8 mHz ~ USB/LSB
Y3 43.1 mHz
IC2
34.2 mHz
T.P 43.1 mHz
PTO B
PTO BD ~ 6-2
VFO A
3.1 to 4.1 mHz
to COUNTER
OFFSET
T.P
39 to 40 mHz
FRONT END BD ~ 6-3
T/R
L.O. XTAL BANK
Y2: 69 mHz → 29
Y3: 68 → 28
Y4: 61 → 21
Y5: 54 → 14
Y6: 47 → 7
Y7: 43 → 3
Y8: 41 → 1
T.P
L.O. Mon
OUTPUT
RF DRIVER BD ~ 6-6
L1-L2 LP FILTER
ALC
KEY
R31 BIAS
P.A. ~ 6-11
2072
REF
TRANSMIT SIGNAL PATH ~ signal one

RECEIVER SECTION PROBLEMS

PROBLEM Excessive hum

CAUSE +34 volt power supply defective.

SOLUTION Check terminal 131 at the power supply board. If it reads approximately 43 volts (this terminal should read +34), check transistors Q4 and Q6 on the power supply board.

PROBLEM Receiver seems slightly or very insensitive.

CAUSE Bad front end FET (located on front end board, A2 and designated Q1).

SOLUTION Make the following check: Turn on the calibrator and adjust the PRESELECTOR and main tuning for maximum S-meter indication at 14.2 Mhz. If it is much less than +20 over S9, Q1 is probably defective. Replace Q1.

PROBLEM No signals or very weak signals but normal calibrate signal.

CAUSE Defective slide switch, S9 on rear of chassis and marked AUX-COM.

SOLUTION Replace this switch. Or better yet, if full break-in CW operation is not contemplated, wire this switch to the COM position.

PROBLEM One or more of the nixie tubes "jumps" or "rolls" from digit to digit.

CAUSE Defective integrated circuit on counter board.

SOLUTION Replace defective IC. If the least significant digit is the trouble (right hand digit as viewed from the front), check IC 9 and IC 13. If the "units" digit is the trouble, check IC 8 and IC 12.

If IC 9 and IC 13 check okay, try connecting a .1 ufd capacitor between pins 5 and 6 of IC 8 to cure right-hand digit rolling.

PROBLEM Transceiver locks up in XMIT state after approximately 1 minute from turn-on. Also, the nixie's do not light.

CAUSE Defective power supply transistors.

SOLUTION Check transistors Q3, Q7, Q8 on power supply board. (Q3 is a TIP-29A - the 5 volt regulator). Q3 is the most probable prospect - it works the hardest! Normal voltages for these transistors are as follows: (values shown are nominal and could vary ±20%)

	Q3	Q7	Q8
BASE	6	.6	6
EMITTER	5	0	6
COLLECTOR	17	6	17

(volts)

PROBLEM Instability in the 43.1 MHZ oscillator.

CAUSE Defective components on BFO board, A4

SOLUTION Replace zener diodes CR8, CR11 with 1N4738A. (These units are probably shorted). Replace R47 (probably overheated)

PROBLEM Sidetone too loud with sidetone pot full CCW.

CAUSE Sidetone potentiometer resistance too high when at minimum.

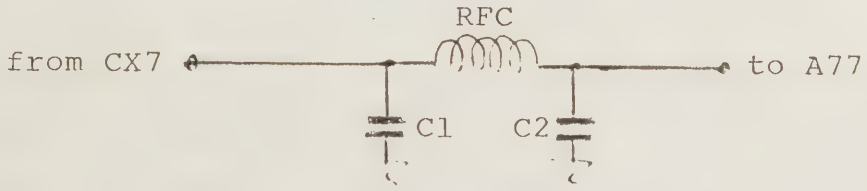
SOLUTION Replacement of pot not necessary. Install a 10K resistor in series with center arm of pot.

OTHER PROBLEMS

PROBLEM Erratic Alpha 77 operation when driving with the Signal/One. (For example, A77 cannot be tuned properly on one or more bands)

CAUSE RF is getting into the A77 via the control relay cable to the Signal/One.

SOLUTION Check to see if this is the problem by disconnecting the relay control cable and shorting the relay jack on the rear of the A77. If the problem no longer exists stray RF is the problem. Build the following circuit in a small minibox and insert it between the A77 and Signal/One relay control line.



C1, C2- .001 1 kv disc ceramic
RFC- RFC in the range of 10-50 microhys and able to handle 100 ma.

PROBLEM Continuous sidetone generation.

CAUSE Shorted transistor on RF driver board, A5.

SOLUTION Check transistor Q7 on RF driver board, A5. Replace.

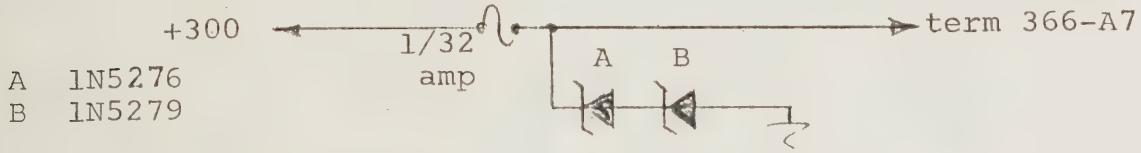
MODIFICATIONS

1 Protection for Q1, input FET for receiver section:

Install back to back silicon diodes across the antenna input and ground. W3HRO suggests a pair of HE-9010's by Linear Systems, California.

2 Protection for counter board against inadvertent high voltage:

Install the following circuit between the 300 volt supply and the 300 volt terminal on the counter board, A7 (terminal 366):



If the +300 volts rises to a high value, the zeners will conduct and force the fuse to blow. (For example if the final developes a plate to screen short, +1500 volts will be placed on the +300 line which will wipe out nearly every semiconductor and tube on A7! If you don't believe it, ask W7IV)

3 Protection of the final tube, 8072:

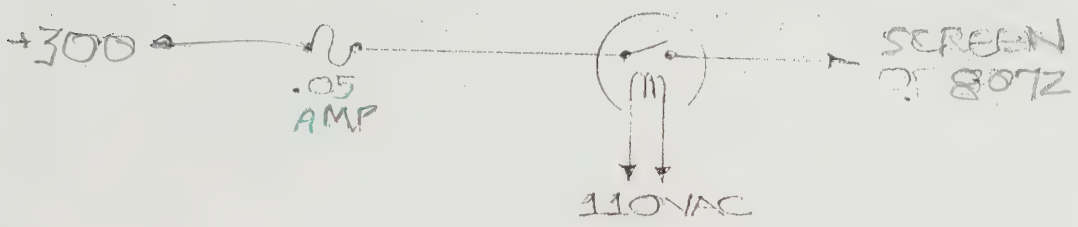
Fuse the plate at 0.5 amp and fuse the screen at .05 amp.

4 To cure parasitic oscillations:

Place a single ferrite bead at the 8072 socket on the grid and screen terminals.

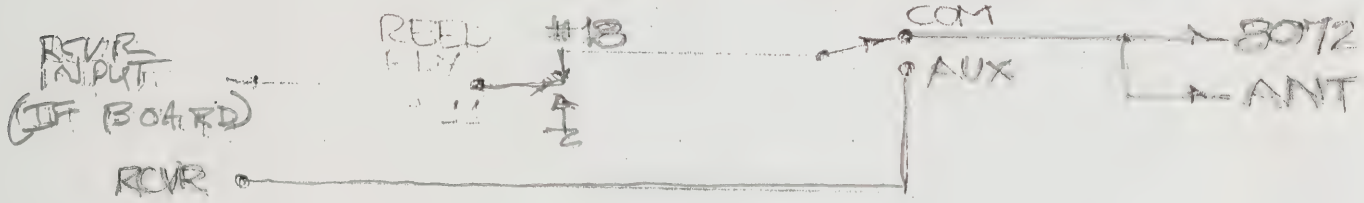
5 To effect better protection for the final tube:

Rewire the amperite time delay tube (K1) as follows:



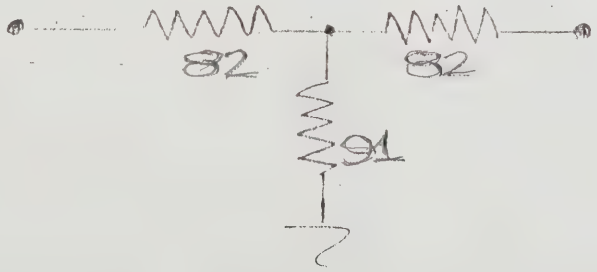
The bias line that is normally controlled by K1 must be shorted (Short A5-259 to A10-5). According to Amperite, there is no problem controlling 300 VDC since heater to ground spec is 800 VDC.

6 To effect better protection for receiver front-end when utilizing the AUX RCVR jack: Rewire as follows:



7 To increase frequency response on units that exhibit a narrow response in transmit and receive making tuning difficult: This is caused when the two 8 pole filters are not flat. Solution is to remove one of them and replace with a simple pad:

Remove FL1 and insert the following pad made up of ½-watt resistors: (FL1 can be inserted into the CW3 position if desired)



8 To cure distortion on transmit (caused by the noise blanker failing to cut completely off on XMIT:

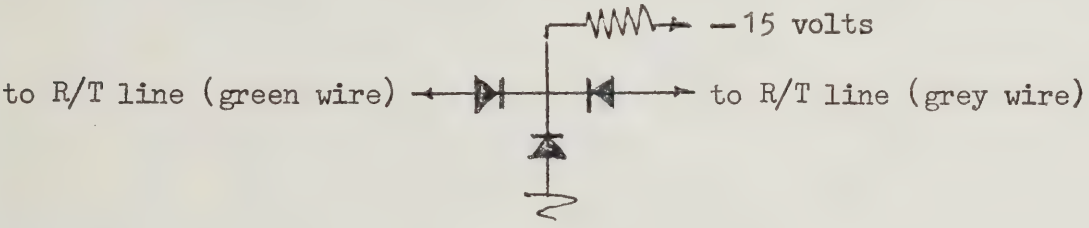
Install a 6800 ohm ½-watt resistor from pin 3 of IC1 (on IF board) to ground. (Pin 3 of IC1 is available from the top of the board from the proper end of R42)

9 To prevent possible burn out of power transformer or High Voltage diodes:

Install a heavy duty globar-type resistor in series with AC. WB4RSK suggests a Workman model FRT2 located at the ON/OFF switch. Remember that these globars get quite hot.

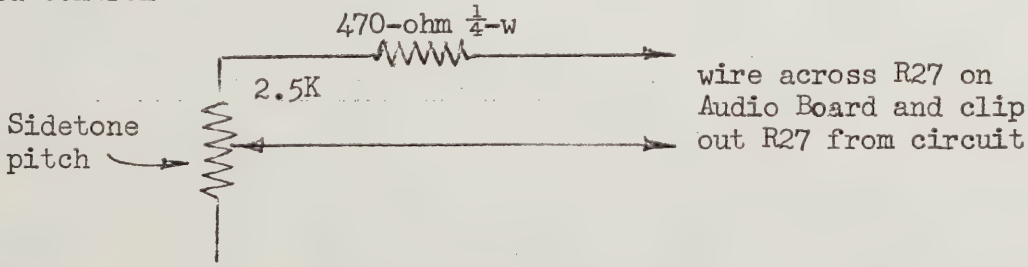
10 To cure frequency shift when switching from one transmit VFO to the other:

Add the following network: (Diodes are 1N4001 and R = 222-ohm/2-watt)



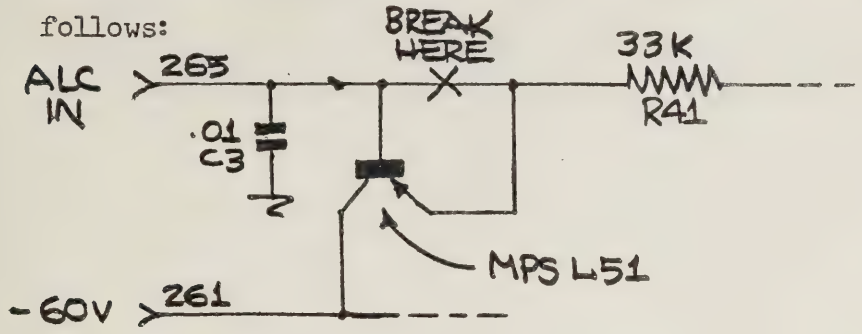
11. To provide variable CW sidetone:

Add the following fixed resistor and potentiometer. The new pot can be installed as a dual concentric unit with the present CW speed control:



12. To allow the use of ALC with ALPHA 77 Linear Amplifiers

Add a single MPSL51 transistor to the RF driver board, A5 as follows:



The desired output may now be set with the ALC potentiometer on the A77.

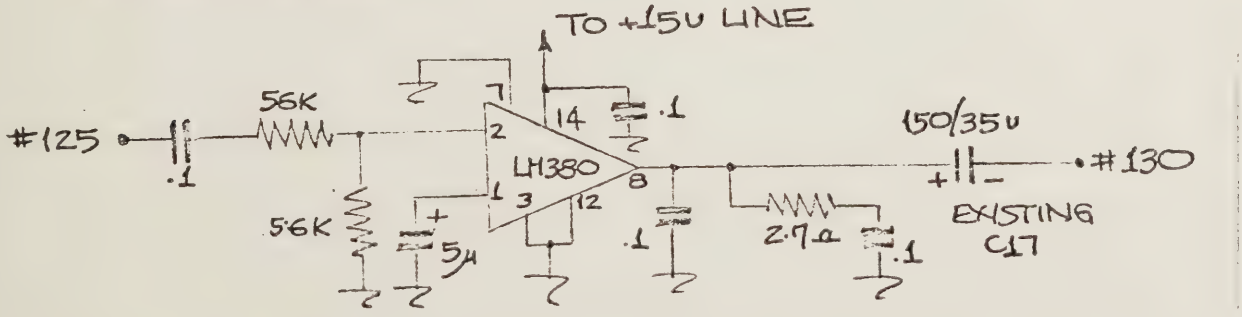
13. To improve receive audio quality and eliminate AGC "pumping" action

Make the following changes on the AGC Detector board, A9;

1. Change R43 from 10K to 1K, ¼-watt, 5%
2. Change C40 from 1 uf to 10 uf, 35 volts
3. Add a 8.2K, ¼-w, 5% resistor in series with the collector of Q13
4. Change C12 from 10 uf to 47 or 50 uf, 35 volts
5. Change Q4 from 2N5183 to Motorola MPSA13

Notes: C40 determines AGC Hang Time
C12 determines slope of the SLOW AGC discharge ramp

14. Modified Audio Output circuit using fewer components than original and will provide cleaner and more audio: The PA237 is replaced by the following circuit:



Notes: Use small vector board for new IC and parts. Note that C17 (existing) may be used but with REVERSED polarity! The output transformer is no longer used - wire pin #130 directly to speaker jack. The 24-volt regulator is no longer used and may be disconnected at the power supply board.

15. To provide protection for the Driver Board in the event of final tube plate-to-grid short.

Replace C30 on the Driver Board, A5, with a 3000-volt disc in place of the presently installed 1000-volt type. Use the same value.

MISCELLANEOUS INFORMATION

1. The driver transistors, Q3, Q4, located on the driver board, A5 are generally type SFR-53104. W7IV suggests the use of type 2N5641 which are easier to come by and by his report work very well.

2. It is recommended that a small muffin-type fan be placed on top of the unit near the rear and sucking out to help cool the final cage and power transformer.

3. TRANSISTOR SUBSTITUTIONS

ORIGINAL	POSSIBLE REPLACEMENTS
SFR-53104	2N5641
40604	40823, Sylvania ECG-221
40603	40822, Sylvania ECG-221
40468A	3N128
TIP29A	2N6101, 2N6103, Motorola S5003, 2N5294
TIP30	Motorola S3027
LM-380	Sylvania ECG-740
2N5183	Sylvania ECG-123, 2N3053
REV2 2N5184	Sylvania ECG-154, 2N3439, MPS-L01
40673	Sylvania ECG-222
B5750 Nixies	B5755

4. It is recommended that every time you have occasion to replace a transistor or integrated circuit, you add a socket prior to the repair. This will make future troubleshooting much easier.

5. It is suggested that BERILIUM COMPOUND be used rather than SILICONE GREASE when replaceing the 8072.

6. Resistor R14 located on the RF driver board, A5 is a bit underrated and if work is being done in this area it is suggested that it be replaced with a 2-watt unit (originally is is ½-watt). R14 is 470 ohms.

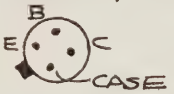
7. For those of you that have older CX7 units, you can illuminate the "S" meter by using a 6 volt lamp, model PTL-20D/6, Mura Corporation. 5 volts for the lamp is available at the back of the counter assembly, pin 7 (wire # 157).

8. An updated technical manual that covers both the CX7 and CX7A is available from THOMAS ADVERTISING COMPANY, 715 Silver Spring Road, Suite 210, Rolling Hills Estates, California, 90274, at a cost of $25.00 plus shipping. The manual is revised in a number of areas from the original CX7 manual.

9. For convenience in troubleshooting the following transistor basing diagrams are given for semiconductors used in the CX7.

40603, 40604, 40468A, 40673 (TO-72)

40235 (TO-104)



2N485/MPF106 (or 2N4416) (TO-92)

2N5183, 2N5184, 2N5187, 2N3301, 2N2222A, MPS3702

2N3391

2N3866 – – –

TIP29A, TIP30 (TO-66)

1645 W. 135th STREET/GARDENA, CALIFORNIA 90249 • PHONE (213) 532-9754
TELEX 629-8276
P.O. Box 127
Franklin Lakes, N.J. 07417

CX7/CX7A RTTY Modifications

The following modifications are necessary to the CX7/CX7A in order to facilitate the integration of the transceiver into the normal amateur radio or MARS radio-teletype station. These modifications provide for the following:

1. Receiving 600 Ohm audio output at J19 for the RTTY terminal unit.

2. Installation of a cable and female RCA connector (cable type) to P6, the AC power connector, to bring out the FSK keyline. → Pin 9 of P6 AC power connection

3. Changing the FSK keyline voltage from -15V to +15V for easier integration into existing equipment. Note: This keyline must be keyed through an inverter stage in order to generate mark-high/space-low transmitted FSK signals.

4. Changing the FSK position receiving mode from USB to LSB in order that the AFSK output to the RTTY terminal unit will be right side up.

5. Converting the CW3 position to function as an additional FSK position having a bandpass of 400 Hz for reception of narrow shift (170 Hz) RTTY signals. This modification requires that the standard CW filter (part #08-S0004-001) be installed. The 400 Hz filter will now be used in both the CW2 position of the mode switch for CW and in the CW3 position for narrow shift RTTY operation. The use of the 400 Hz filter for narrow shift (170 Hz) RTTY reception will improve the received signal plus noise to noise ratio by 6 DB over the use of the normal 1200 Hz bandpass RTTY filter (part #08-S0005-001).

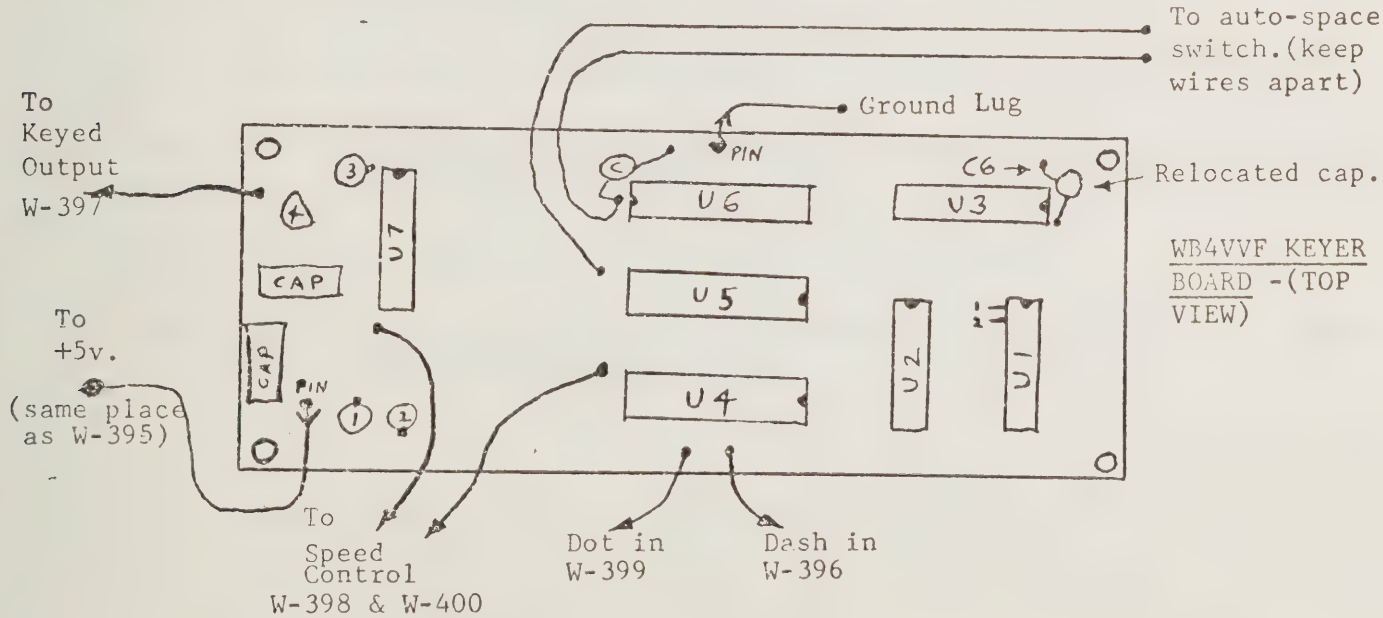
Note: Item One, J19 is marked 'spare' in the rear of the unit.

KEYER REPLACEMENT

The CX7 keyer leaves a bit to be desired. The following (by W8CXS) is a step by step procedure for installing the popular WB4VVF keyer into the CX7. The modification utilizes the PC board currently available for the WB4VVF keyer.

---

1. Circuit diagram pg. 364 of ARRL Handbook, 1975.(CR2 & 2000 uF cap not part of board)
2. Move .001 cap C6. One lead to new hole near "W" in WB4VVF foil etching. Complete step 3 before re-installing capacitor.
3. File down short sides of board to 3 5/8". Leave some edge foil in place.
4. Remove VR-1 , 5 volt zener. Remove R13, 27 ohm. Install jumper wire across R13 loc.
5. Remove lead wire for manual key.
6. Remove lead wires +5 v. input & ground. Enlarge holes & install Male term pin.
7. Cut 2 wires for Auto-space to 5" and tin ends, 1/4 ".
8. Cut 5 wires: Output, Dot, Dash, Speed, Speed 4" past board edge & install Female term pins. Cover with 2" long sleeving.
9. Solder new new 6" long brown wire to +5 v term inside counter compartment (has brown wire & electro cap). Install Female term pin on free end.
10. Solder new 6" black wire to ground lug & install Female term pin on free end.
11. Mount board on 3/16" spacers with #4 hardware on inside of counter cover. Board should almost touch both sides of cover and will be centered so that the components will fit into the open area of the counter board when the cover is in place.
12. Mount 1/4" toggle switch for auto-space at rear, side, of cover toward 3 board stack. Do not twist wires together from board to switch. Solder switch wires.
13. Connect term pins to those removed from counter board & cover with sleeving. Conn new +5v and Gnd leads to board. Dress leads away from Nixies and keep keyed output lead away from the Dot-Dash input leads.
14. Operation of CX-7 Mode switch between CW1 & USB will cause keyer to send a Dash due to induced voltage in the common wiring harness. Replace wires #162 & #163 with shielded pair between rear terminals of counter cage and the keyer jack. Ground shield at the jack end only. The .01 uF jack bypass caps may be .005 uF. Route shielded pair over top side of chassis to hole near keyer jack.



15. To remove the Dash memory feature of the keyer, cut foil to pin #2 of I.C. U-1 or if in a socket, bend pin #2 out to one side and re-insert the I.C. This will not effect any other operation of the keyer.
16. The auto-space switch may be operated with a small screwdriver thru a vent hole in the cabinet . Note that the auto-space feature is active when the switch is OPEN.

Enclosed are revised pages for your CX7/CX7A Operation and Maintenance Manual.

To replace these pages carefully remove the comb-binding tabs one at a time. Remove and replace the revised pages then re-assemble the book by re-inserting the tabs one at a time.

Description of Revisions

Page 5-5, Figure 5-4: C-39 changed to C-59; C-58 changed to C-57.

Page 6-2: Wire #103 - change R3-8 to P3-8.

Page 6-5: Wire #394, "white" change to "blue"
Wire #395, "white" change to "brown"
Wire #402, "white" change to "violet"

Page 6-19: Remove connection between input terminals A & B.

Page 7-12: R-8, Signal/One P/N changed to 10-S0013-040

Page 7-13: R-45 changed to 2.7K
R-46 changed to 1-K, Signal/One P/N changed to 10-S0013-032
C-4, Signal/One P/N changed to 11-S0005-006
C-10, C-11, Signal/One P/N changed to 11-S0005-002

Page 7-14: Q1, Signal/One P/N changed to 20-S0029-001
Q5, Q6, Signal/One P/N changed to 20-S0027-001

Page 7-16: C-10 thru C-13, Signal/One P/N changed to 11-S0005-006

Page 7-21: R 109 changed to read "Resistor, fixed same as R-4," Signal/One P/N changed to 10-S0013-032.

Page 7-23: IC1, Signal/One P/N changed to 72-S0008-001

Page 7-25: C-12 thru C-18, Erie P/N change to 357-000-X5UO-102M, Signal/One P/N 11-S0024-001 added

T/A Rev 9/25/73

PROBLEM S-meter readings seem low but receiver is operating normally.

CAUSE Defective transistor or misadjustment on AGC detector board, A9.

SOLUTION Check transistor Q14 (2N5183) on AGC detector AGC board, A9. Also check for proper adjustment of R26. This adjustment requires the use of an external signal generator.

PROBLEM No slow AGC action.

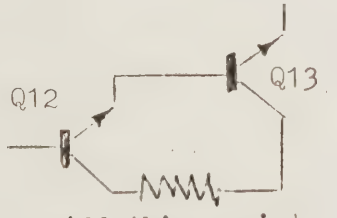
CAUSE Defective transistor Q12 (2N5183) on AGC detector board, A9.

SOLUTION Replace Q12. (A 2N2222 is a satisfactory substitute). Q13 should also be checked.

PROBLEM Loud pops in receive.

CAUSE Poor AGC action.

SOLUTION Add a 6800 ohm, $\frac{1}{4}$-watt resistor as shown below. Q12 and Q13 are located on the IF board, A8.



Add this resistor

PROBLEM S-meter readings seem low.

CAUSE Misadjusted R26 on AGC Detector Board (A9) or improper bias on AGC amplifier, Q1.

SOLUTION Check a signal (as weak as possible with AGC ON). Turn AGC to OFF - signal should not increase in level. If it does, this indicates that the AGC is energizing and desensitizing the front end. Check voltages on pins 479 and 509 on AGC Detector board, A9 while adjusting R26 per the manual. If adjustment does not seem to be obtainable, change R8 from 10K to150K. This changes the bias on Q1 and it will take a stronger signal to bias Q1 to the on state.

PROBLEM Receiver insensitive in both slow ans fast AGC and S-meter hangs at S-9. With AGC off, normal operation.

CAUSE Bad transistor Q3 (2N5183) on AGC detector board, A9.

SOLUTION Check transistor Q3 on board A9 for emitter to collector short. Replace.

PROBLEM Very poor sensitivity and obvious change in sensitivity when going from Transceive to Split frequency operation

CAUSE Defective CR2 on Audio board (1N270)

SOLUTION Replace CR2. To check this problem: Measure R/T voltage. If CR2 is defective this R/T voltage in receive will read 1.5 volts rather than the normal +.4 volt.

R. D. CUNNINGHAM
1477 N. 96th AVE.
OMAHA, NB., 68114

CUSTOM ELECTRONICS
SIGNAL ONE REPAIRS
(402) 391 6230

CX7B LED COUNTER BOARD
INSTALLATION INSTRUCTIONS

1. Remove outside dust cover from radio.
2. Remove perforated cover from counter board housing.
3. Carefully disconnect all Amp connectors from Nixie counter board.
4. Un-solder wire #402(purple wire) from C46(feed-thru capactor located on rear panel of counter board housing).
5. Remove four mounting screws holding old counter board to the standoffs and remove board from radio.
6. Place new LED counter board in position and connect the Amp connectors to the board as shown. If wires are not long enough to reach the pens, they will have to be extended by splicing a wire to them.
7. Screw down the new LED board to the four mounting standoffs and replace perforated cover.
8. Replace 6 volt meter lamp with new 12 volt lamp. The white wire connected to the left hand lamp terminal may be removed from the radio or its end covered with tape or sleeving. From this terminal run a new wire to C6, filiment feed-thru capactor located on upper power amplifier compartment. Remove black wire from right lamp terminal that goes to meter ground. Install 22 ohm 1/2 watt resistor from lamp's right terminal to meter ground.
9. Remove R4(47K) from power supply board.
10. Replace CR13 and CR15(located on power supply board) with 3 amp diodes.
11. Remove R29 from power supply board and install 7.5 ohm 10 watt resistor in its place.
12. Install 100 MF capactor across the 7.5 ohm resistor installed in step 11. The capactor's "-" lead is connected to pen 175.
13. Remove Q8 from power supply board. Ground wire #66(connected to pen 138 on power supply board).
14. Remove Q3(TIP 29A with the brown lead located on the radio's back panel) and replace with a MC7805 voltage regulator integrated circuit. Do not insulate the mounting tab, however, cover the mounting tab with thermal conductive compound. Re-solder the brown wire to the IC's output pen(same pen as TIP 29's emitter). Solder wire #66 to center pen and wire #67 to input pen(same pen as TIP 29's base pen).

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SPECIAL INSTRUCTIONS FOR RADIOS EQUIPPED WITH THE NEW CX7B POWER SUPPLY BOARD.

1. Perform instructions 1 thru 9.
2. Do not replace diodes in step 10 if they have a 3 amp rating.
3. Some boards have a 5 or 10 ohm 10 watt resistor in series with the 24 volt line going to the 5 volt regulator. If this resistor is not in the circuit, a 7.5 ohm 10 watt resistor should be installed. This can best be done by soldering a terminal strip to the new board and mounting the 7.5 ohm resistor to it's outer terminals. Wire #67 is removed from pen #137 and connected to one side of the resistor. A wire is connected to the other side of the resistor and soldered to pen #137. Connect 100 MF capactor accross the 7.5 ohm resistor. The "-" side is connected to the side connected to pen #137.

To varify power supply board modifications, remove wire #395 from counter board pen #357 and apply AC power to the radio. Voltage at wire #395 should be 5 volts D. C.

In normal operation, the counter's frequency resolution is 100 Hertz. However, by moving the jumper located in front of the LED board from pen Y to pen X, resolution is increased to 10 Hertz. The decimal point is internally fixed and cannot be moved one place to the left. Also, the new counter, as with the old counter, resets to 900.0; the most significant digit will be one digit low. To read the BFO frequency, wire #479(VFO "B" input) is removed from counter board pen 352. Connect a short jumper from AGC board pen 487 to counter board pen 352. CAUTION: do not let the jumper short out any of the components on either board. Transmit and receive VFOs must be in VFO "B" position. If the mode switch is in "USB", the counter should read approximately ".065.0". Actual frequency is "16.50". Counter update time with the jumper connected to pen X is 1.2 seconds; in normal operation, update time is 0.12 seconds.
The 8.8 MHz carrier, using the new LED counter, can now be adjusted as per the manual.

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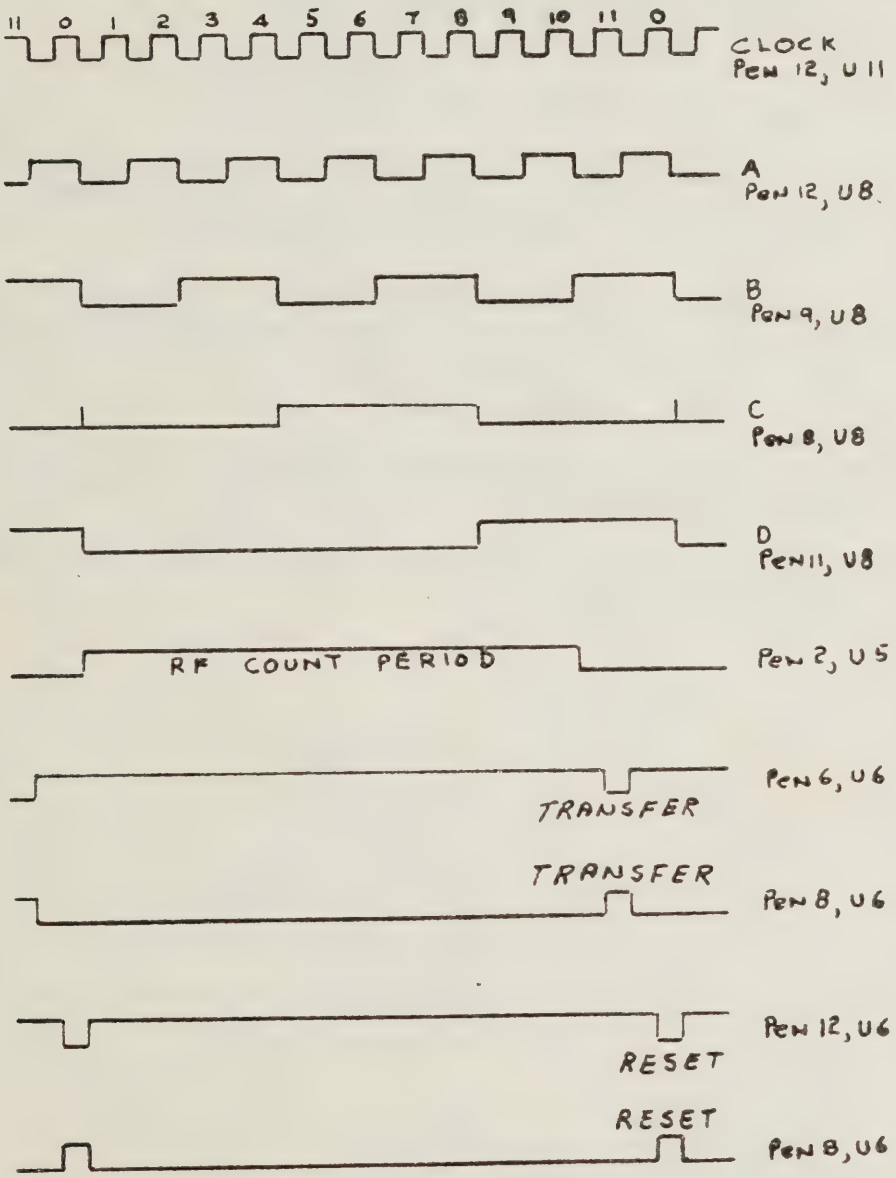

CX7B LED COUNTER

Counter timing block diagram

R. D. CUNNINGHAM
1477 N. 96th AVE.
OMAHA, NB., 68114

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FEATURES OF THE NEW STATE-OF-THE-ART SIGNAL ONE LED COUNTER BOARD

First digit is flicker free.

Counter can easily be used as a frequency counter to align the radio's transmitting BFO. In test position, counter resolution is 10 Hertz.

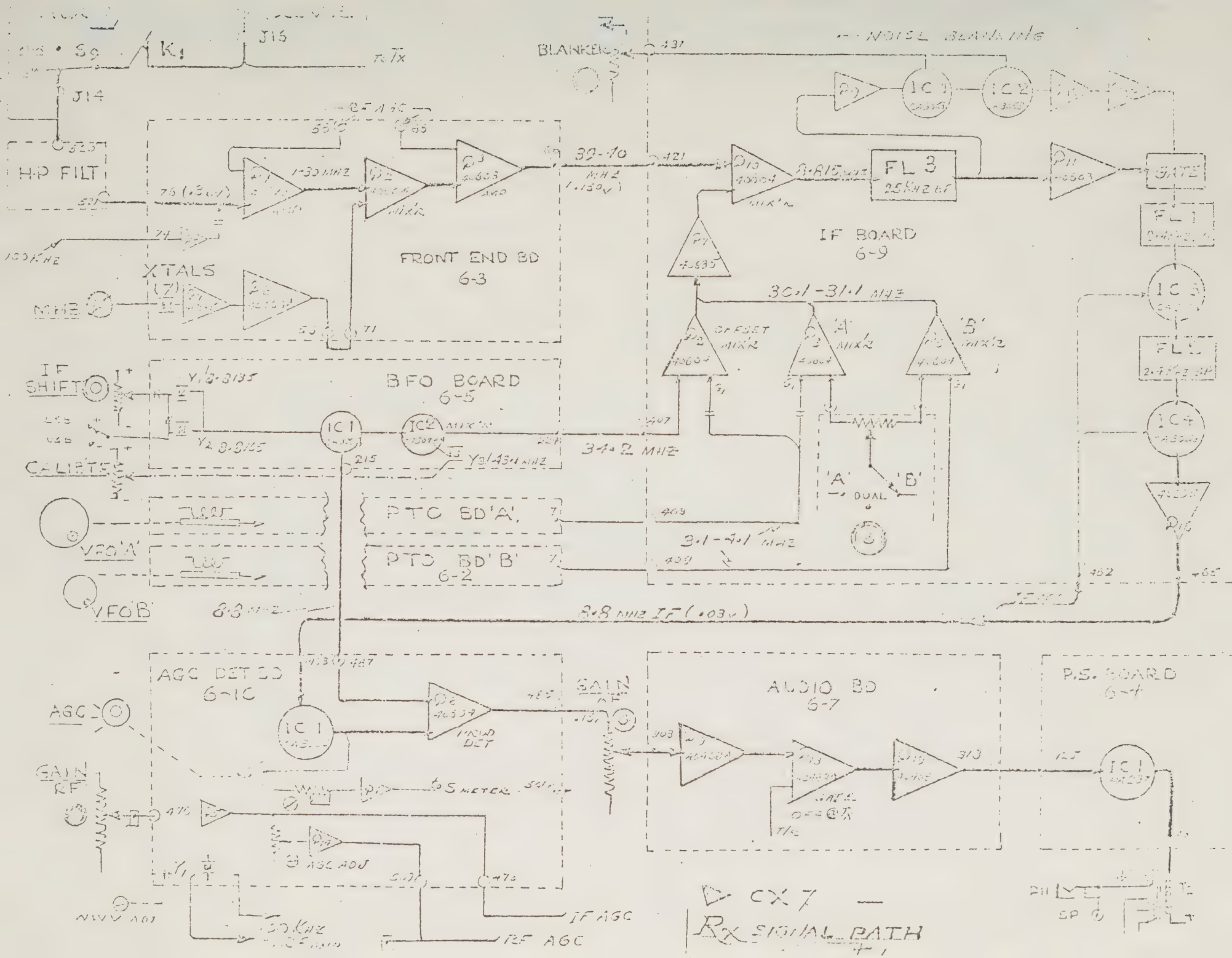
Seven segment Hewlett Packard light emitting diodes (LED) used as readout displays. Designed for a viewing distance of up to 20 feet, they provide a high contrast ratio and wide viewing angle.

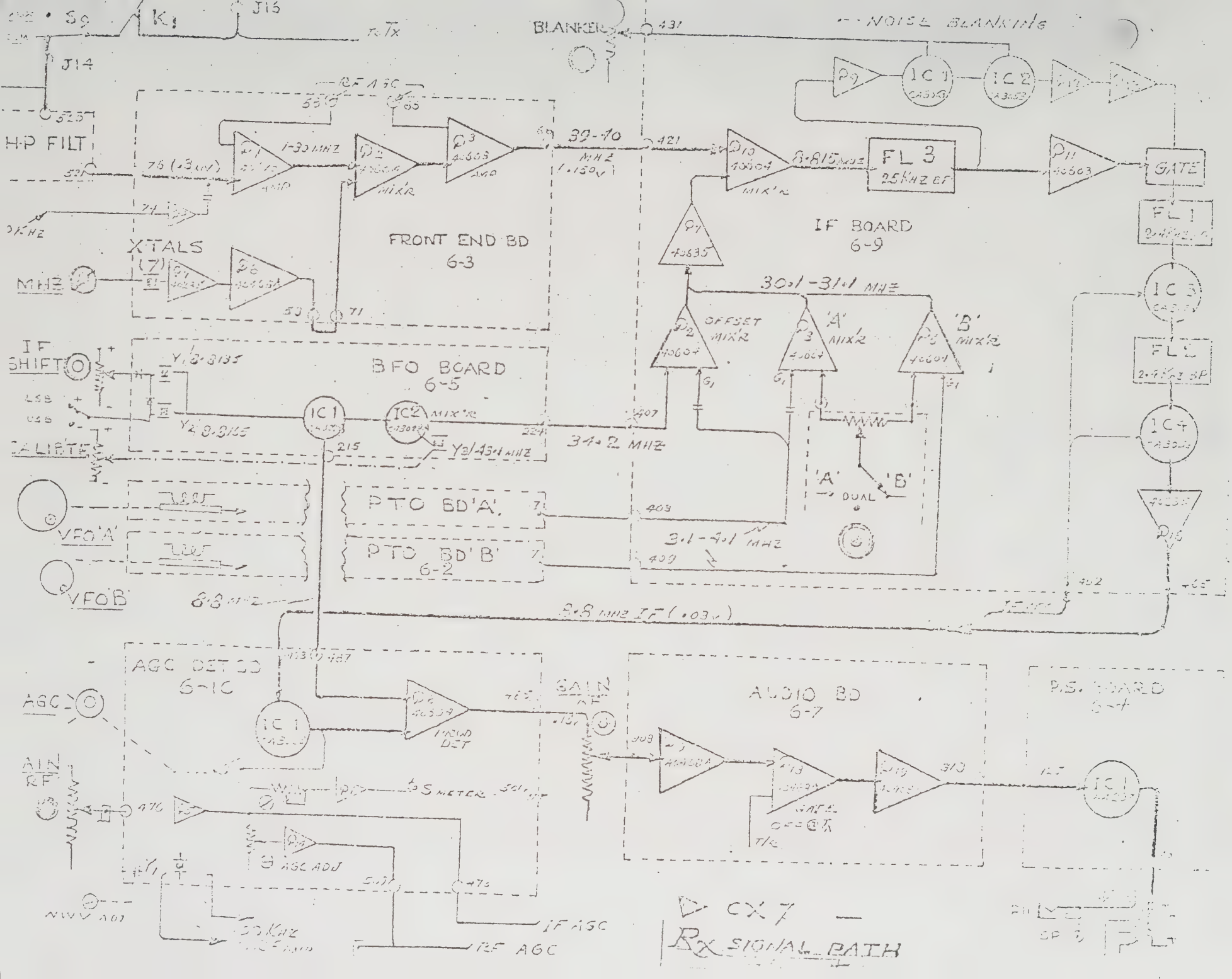
The board's 19 integrated circuits and four LED displays are plugged into Molex IC pen sockets.

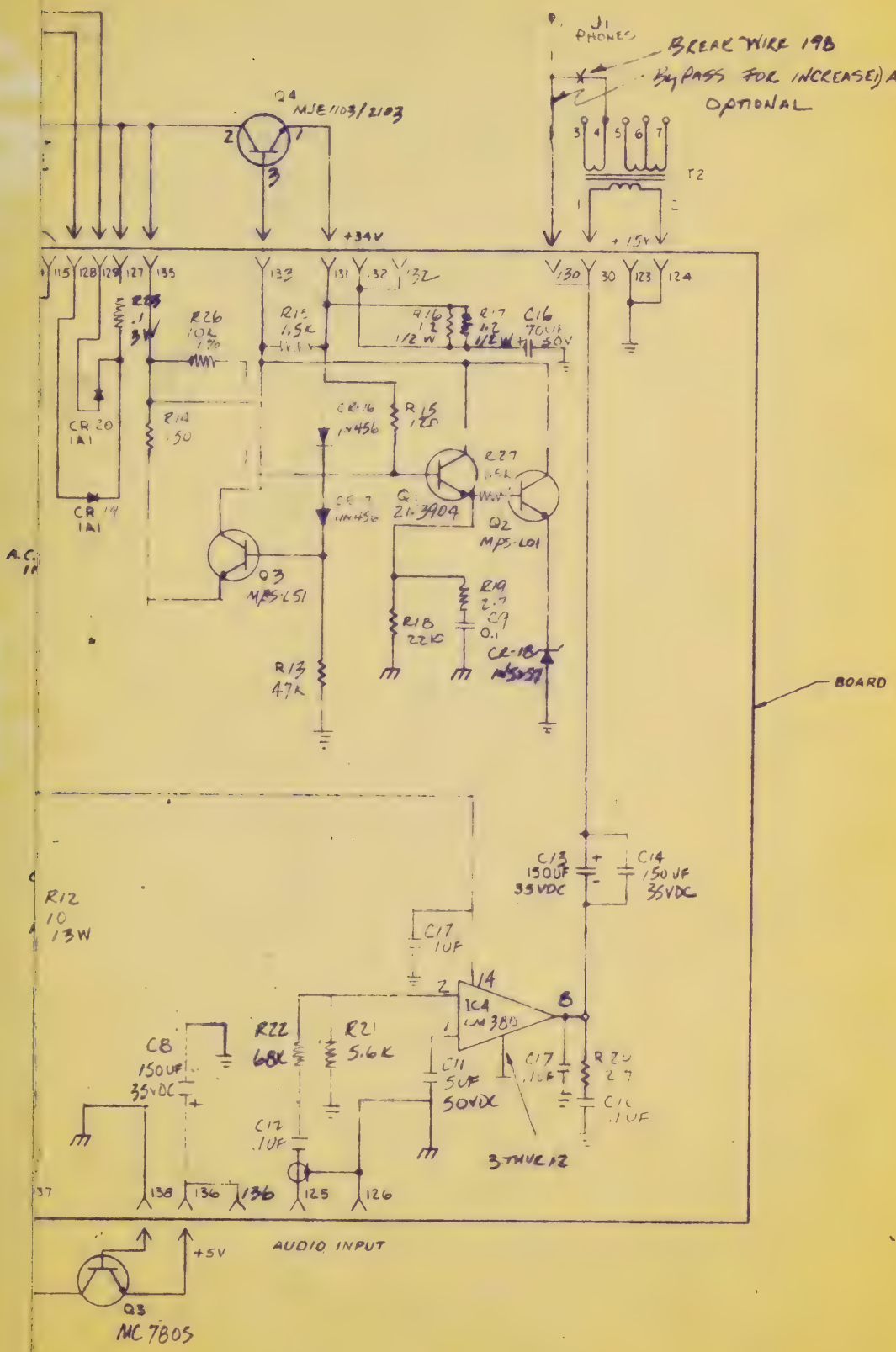
All integrated circuits are readily available and are field replaceable.

AC 166
AC 165
AC 164
AC 163
HV, 162
ref 161
ref. 160
yello 159
(66) 158
(85) 157
(84) 156
(83,128) 155
(82) 154
(81) 153
(80) (208) 152
(78,209) 150
(77) 149
(76) 148
ORANGE 146
72 (73) 145
73 (72) 144
143
N.C. 142
(69) 141
(38) 140
(68) 139
67 (66) 138
66 (67) 137
(157,211) (65) 136
(64) 135
(63) 134
(61) 132
(62) 131
(59,60) 130
(56) 127
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
green
red
blue
XFORMER C.T.
CR1
CR2
CR3
CR4
R8
R7
R6
R1
R40
R14
R4
R5
C1
C2
CR10
CR9
CR20
CR21
C12
C3
IC1
R13
R12
C5
CR8
C2
R11
R10
Q1
CR18
C10
C9
C11
R17
R16
R15
IC2
IC3
C6
C7
C8
R18
R20
CR19
CR16

AC 166
AC 165
AC 164
AC 163
HV, 162
ref 161
ref. 160
chassis 159
(66) 158
(35) 157
(84) 156
(83, 25) 155
(82) 154
(81) 153
(80) (208) 152
151
(78, 209) 150
(77) 149
(76) 148
10 UNUSED
ORANGE 146
72 (~~73~~) 145
73 (~~72~~) 144
143
N.C. 142
71 UNUSED (69) 141
70 UNUSED (38) 140
(68) 139
67 (~~65~~) 138
66 (~~67~~) 137
(157, 211) (65) 136
(64) 135
(63) 134
UNUSED ( ) 133
(61) 132
(62) 131
(59, 60) 130
Blue ( ) 129
Blue ( ) 128
(56) 127
CR1
CR2
CR3
CR4
R6
R1
R40
R7
R8
R14
R4
C1
CR10
CR9
C2
R5
R9
JUMPER
CR8
CR7
CR6
CR5
CR20
CR21
C12
C3
IC1
R13
R12
Q5
Q2
CR19
R11
R10
Q1
CR18
C10
R17
C9
C11
R16
R15
IC2
IC3
C6
C7
C8
CR17
CR16
R18
R19
R20
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
Front End
A2-63
55-15
A-6327
IF-1
IF-2
A8-43
IF-3
R.O.
15V
T.O.
R-15
green
+15V
red
yello
blue
XFORMER C.T.


J15
To Tx
BLANKER
NOISE BLANKING
J14
H-P FILT
525
AGC
FRONT END BD
6-3
XTALS
100 KHZ
MHZ
IF BOARD
6-9
30.1-31.1 MHZ
OFFSET MIXER
'A' MIXER
'B' MIXER
FL 3
25 KHZ BP
FL 1
FL 2
2.4 KHZ BP
GATE
IC 1
IC 2
IC 3
IC 4
IC 5
IF SHIFT
CALIBRATE
BFO BOARD
6-5
Y1 8.3135
Y2 8.3145
Y3 43.4 MHZ
34.2 MHZ
'A' 'B' DUAL
PTO BD 'A'
PTO BD 'B'
6-2
VFO 'A'
VFO 'B'
8.3 MHZ
8.8 MHZ IF (.03V)
AGC DET BD
6-10
AGC
GAIN RF
S METER
AGC ADJ
NWW ADJ
50 KHZ
IF AGC
RF AGC
AUDIO BD
6-7
GATE OFF @ X
P.S. BOARD
6-4
SP
CX 7
Rx SIGNAL PATH


J16
To Tx
BLANKER
NOISE BLANKING
J14
H-P FILT
IF AGC
FRONT END BD
6-3
XTALS
MHZ
30-40 MHZ
1-150 V
IF BOARD
6-9
8.815 MHZ
FL 3
25 KHZ BP
GATE
FL 1
30.1-31.1 MHZ
OFFSET MIX'R
'A' MIX'R
'B' MIX'R
IF SHIFT
BFO BOARD
6-5
Y1 8.3135
Y2 8.3105
Y3 43.1 MHZ
34.2 MHZ
CALIBRATE
PTO BD 'A'
PTO BD 'B'
6-2
3.1-4.1 MHZ
DUAL
VFO 'A'
VFO 'B'
8.8 MHZ
8.8 MHZ IF (.03 V)
AGC DET BD
6-10
AGC
GAIN
AUDIO BD
6-7
P.S. BOARD
6-4
AIN
RF
S METER
AGC ADJ
IF AGC
RF AGC
CX 7 —
Rx SIGNAL PATH



gure 6-4. Power Supply Board A3 Schematic Diagram

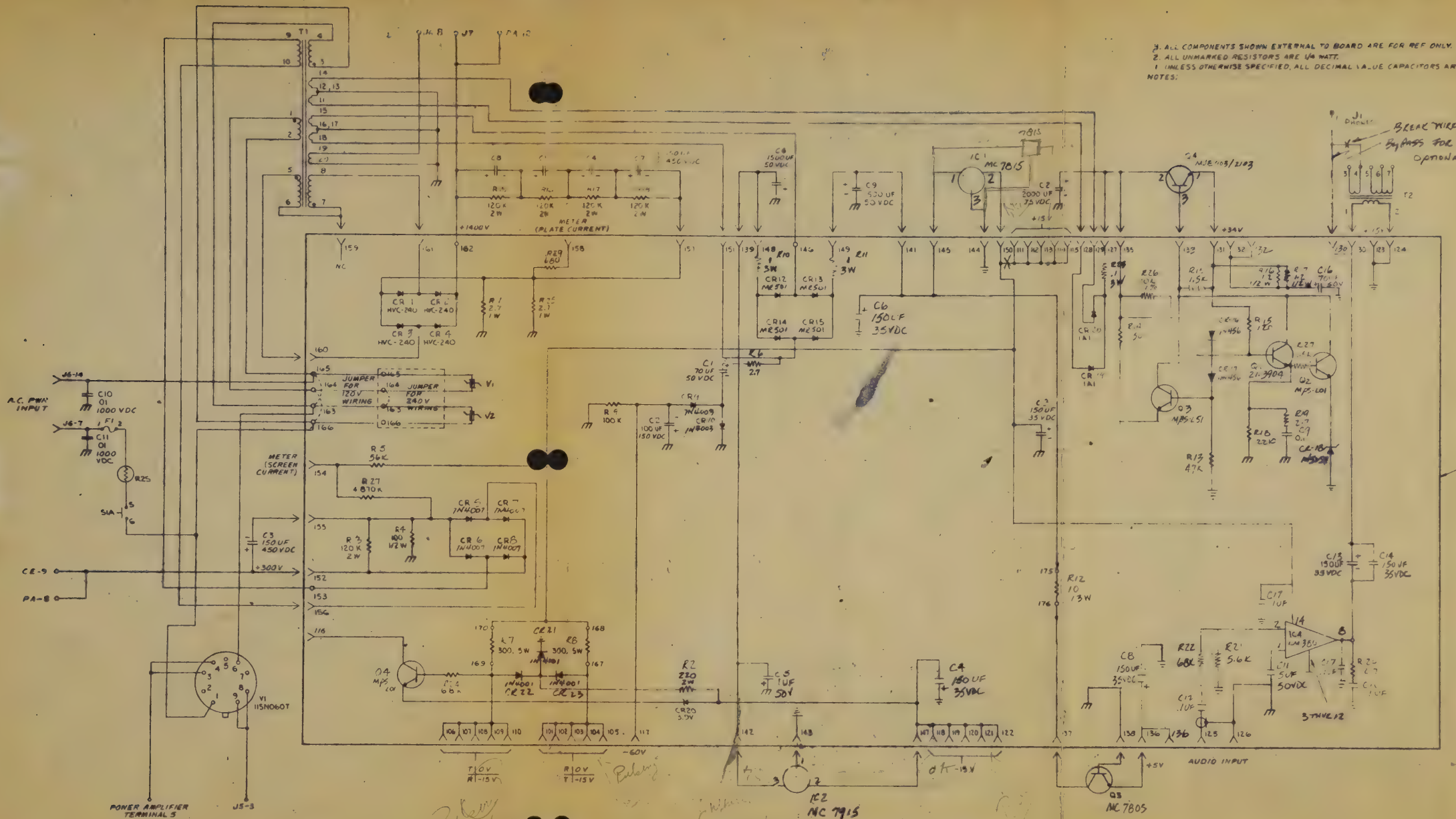
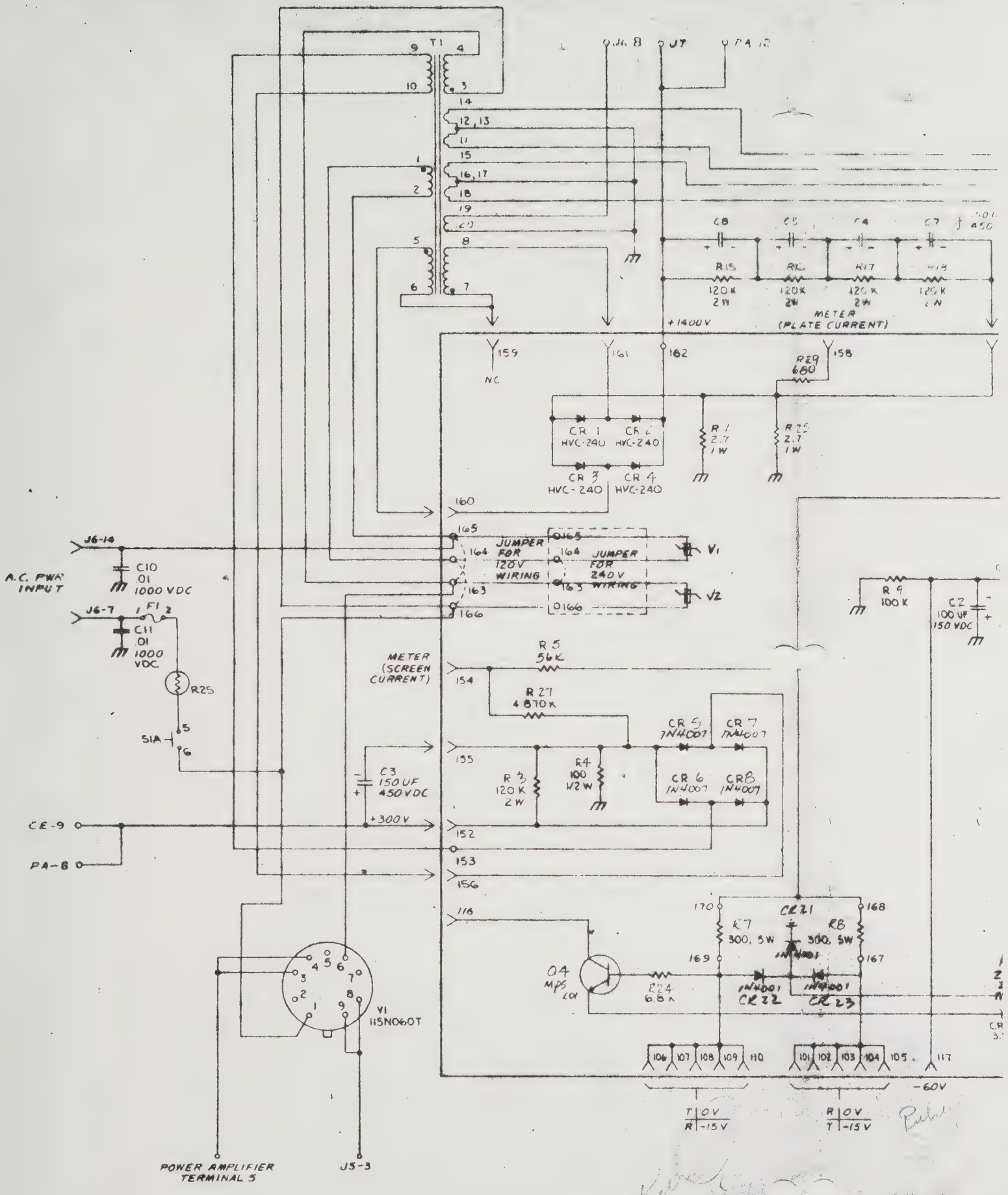


Figure 6-4. Power Supply Board A3 Schematic Diagram


T1
J6-8
J7
PA-8
C8
C5
C4
C7
R15
R16
R17
R18
120K 2W
METER (PLATE CURRENT)
+1400V
159
NC
161
162
158
REG 680
CR 1 HVC-240
CR 2 HVC-240
CR 3 HVC-240
CR 4 HVC-240
R1 2.7 1W
R25 2.7 1W
160
165
164
163
166
JUMPER FOR 120V WIRING
JUMPER FOR 240V WIRING
V1
V2
J6-14
A.C. PWR INPUT
C10 .01 1000 VDC
J6-7
F1
C11 .01 1000 VDC
R25
S1A
METER (SCREEN CURRENT)
R5 56K
154
R27 4870K
CR5 1N4007
CR7 1N4007
CR6 1N4007
CR8 1N4007
R3 120K 2W
R4 100 1/2W
C3 150UF 450VDC
+300V
155
152
153
156
R9 100K
C2 100UF 150VDC
CE-9
PA-8
116
170
168
169
167
CR21
R7 300, 5W
R8 300, 5W
Q4 MPS
R24 6.8K
CR22
CR23
106 107 108 109 110
101 102 103 104 105 117
-60V
T 0V R -15V
R 0V T -15V
V1 11SN060T
POWER AMPLIFIER TERMINAL 5
J5-3

NOTES:
1. UNLESS OTHERWISE SPECIFIED,
2. ALL UNMARKED RESISTORS AR
3. ALL COMPONENTS SHOWN EXTE

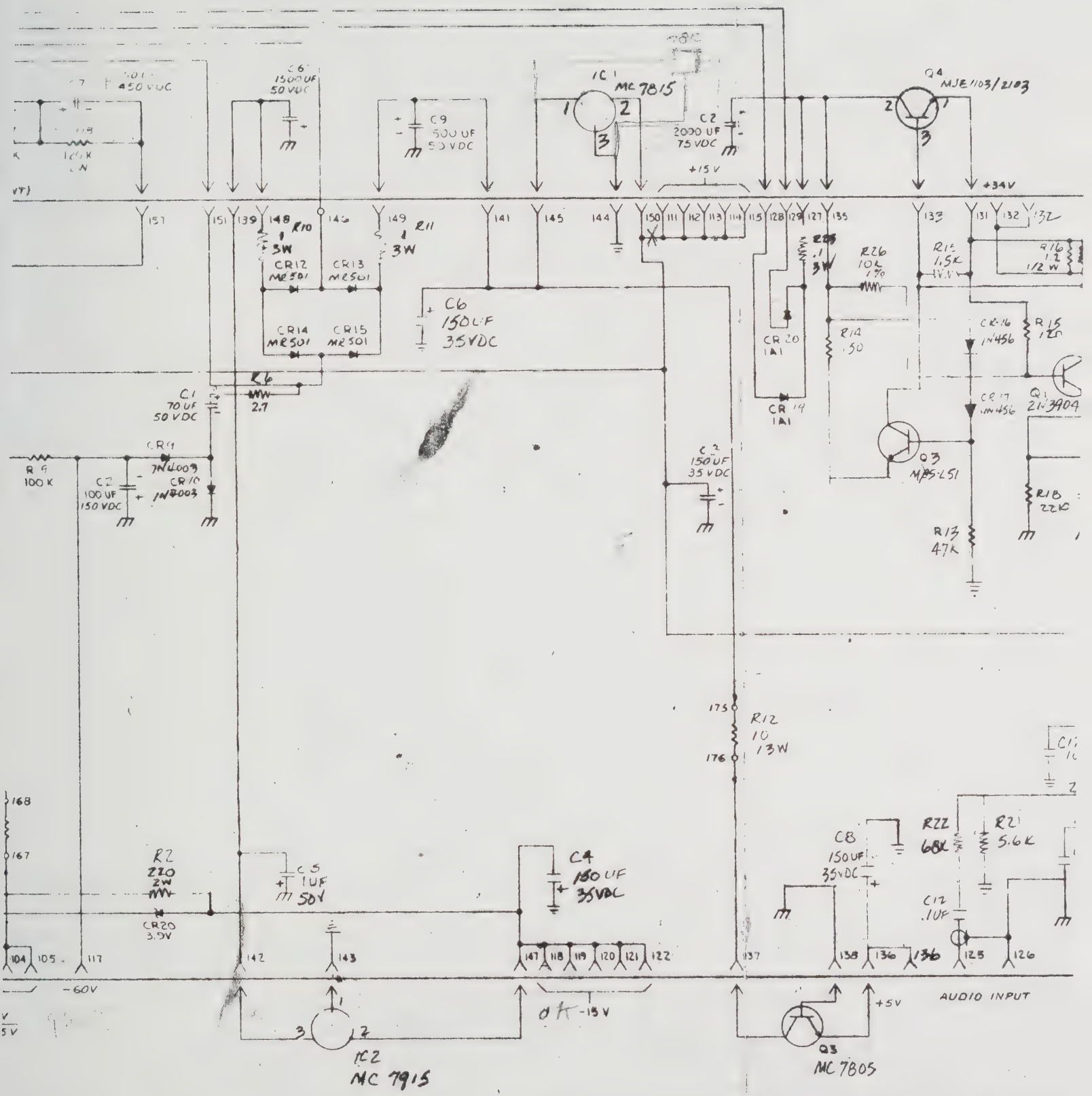


Figure 6-4. Power Supply Board A3 S

NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL DECIMAL VALUE CAPACITORS ARE IN
2. ALL UNMARKED RESISTORS ARE 1/4 WATT.
3. ALL COMPONENTS SHOWN EXTERNAL TO BOARD ARE FOR REF ONLY.

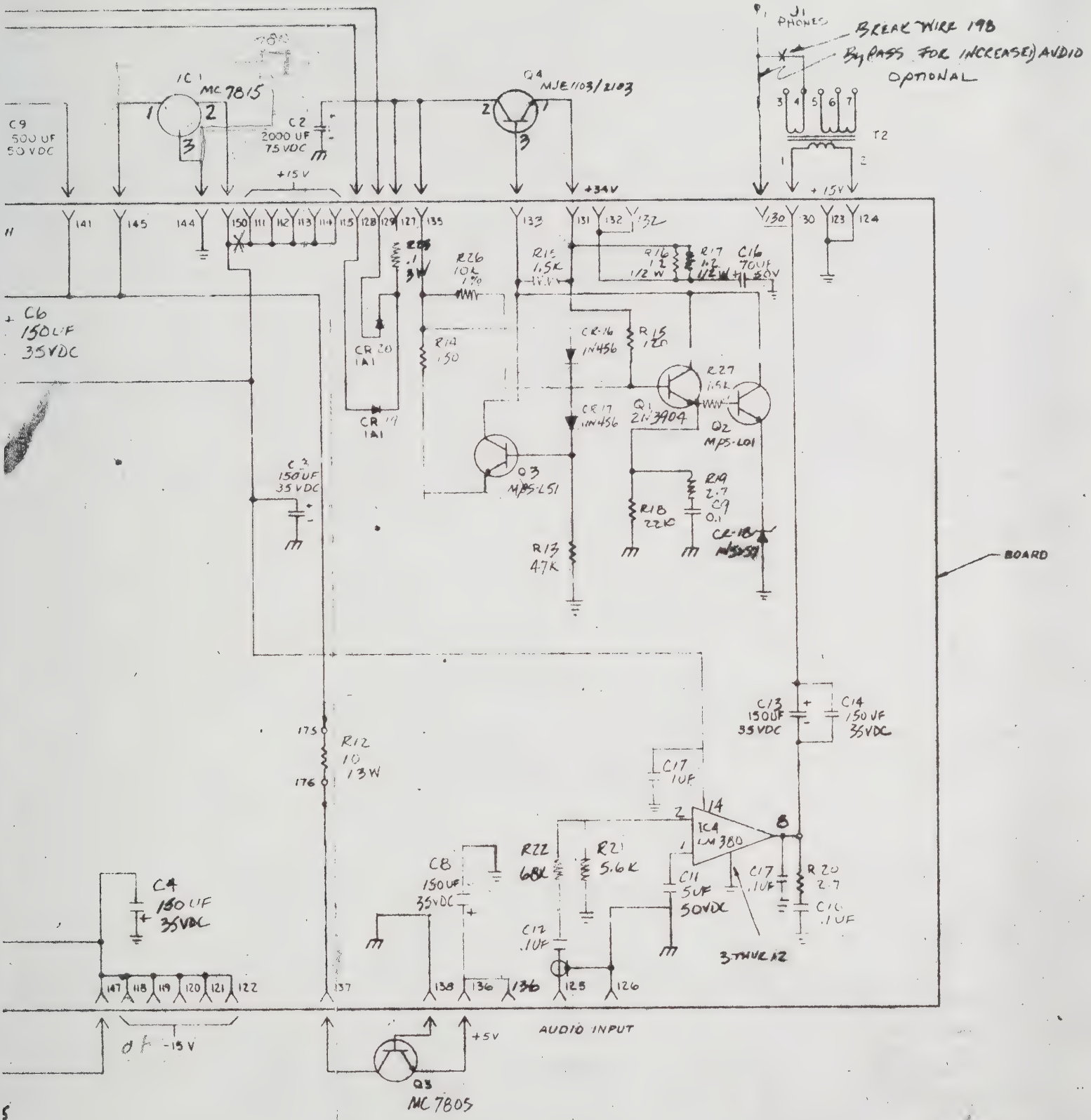
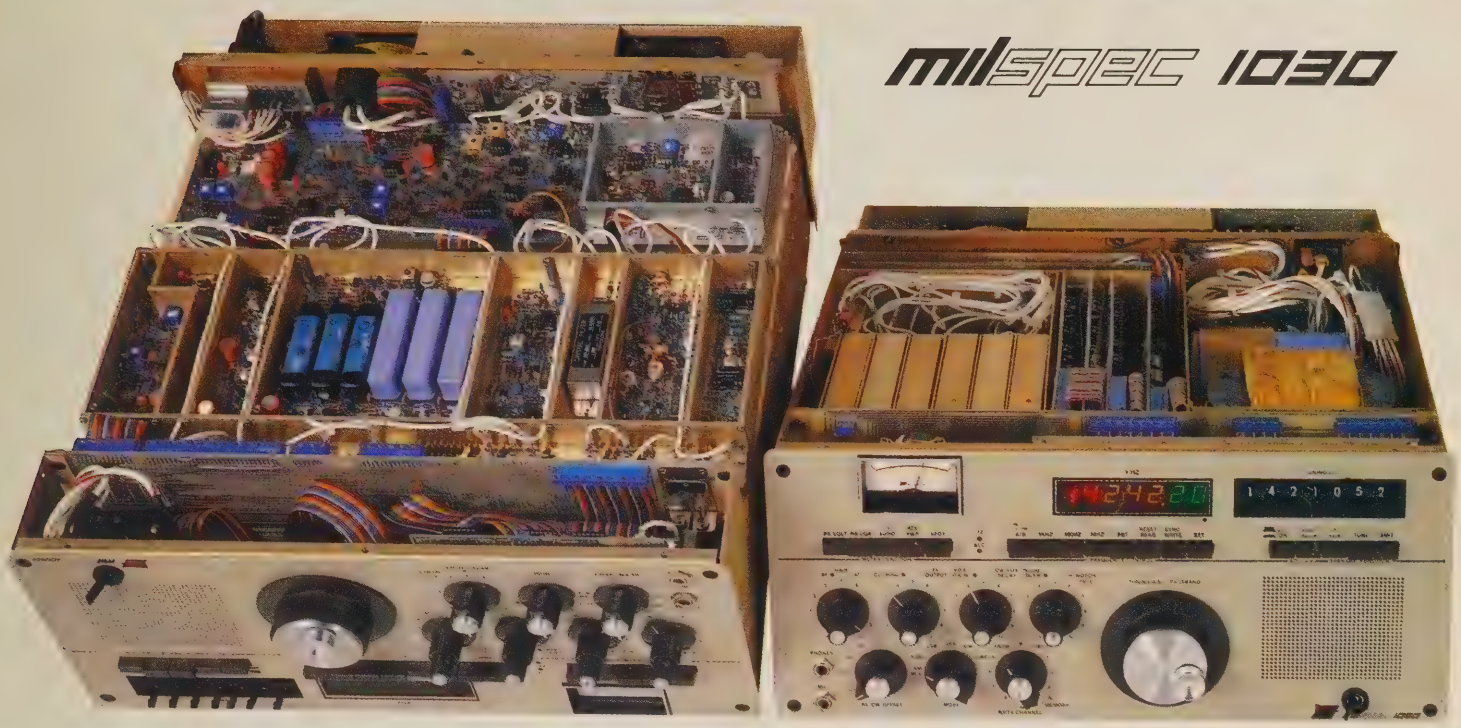


Figure 6-4. Power Supply Board A3 Schematic Diagram

THE FIRST...
FULLY SYNTHESIZED* HF TRANSCEIVER.



milspec 1030

The Signal One Corporation continues its leadership with the introduction of the Milspec 1030, ***A NEW CONCEPT IN SYNTHESIZER TECHNOLOGY. COMBINING THE ENTIRE DIGITAL FREQUENCY CONTROL SYSTEM, INCLUDING PASSBAND TUNING AND BFO FREQUENCIES, WITH THE MAIN TUNING, FREQUENCY PRESET AND REMOTE COMPUTER CONTROL . . .** we have achieved an ultra fast, real time frequency controlled, high performance, military grade, fully synthesized communications system that will out perform any HF transceiver ever offered in the amateur and commercial market.

Featuring:

● **Fully Synthesized General Frequency Coverage:** 10 kHz — 30 MHz in 1kHz,100 Hz or 10 Hz steps; tunable with encoder or thumbwheel preset; stability of 1 Hz/C°.

● **Lever Switch Frequency Pre-Set:** Provides instantaneous band change;sets to within 10 Hz;automatically returns to Tuning A/B. The fastest and most convenient method of frequency entry and recall with additional digital display and memory, **TUNING C,** make this superior to keyboard systems.

● **New Synthesizer Technique:** 120 dB/Hz phase noise close to carrier; extensive CMOS circuitry used for improved spectral purity and great reduction of digital noise—a problem that plagues other HF transceivers causing unwanted mixing products—that insures weak signals will not be covered by internally generated noise due to adjacent strong signals.

● **Real Time Frequency Acquisition:** Not multiplexed; unique synthesizer design allows frequency jumps of 30 MHz in 10 milliseconds, useful in military surveillance applications that demand ultrafast synthesizer switching.

● **Remote Control and Programability:** Permits transceiver use in computer based communication systems. (Optional interface req.)

● **Unequaled Receiver Dynamic Range and Front End Selectivity:** + 20 dBm, 3rd, order intercept point and .25 uV sensitivity offer the best immunity to strong signal overload currently available to the commercial and amateur market. Specially developed high level monolithic, double quad balanced mixers combined with low synthesizer phase noise and up-conversion to 40.455 MHz 1st. I-F thru 8 pole Crystal Cross Mod. Filter with a ± 4 kHz bandwidth, designed for low intermodulation distortion products, makes this performance possible.

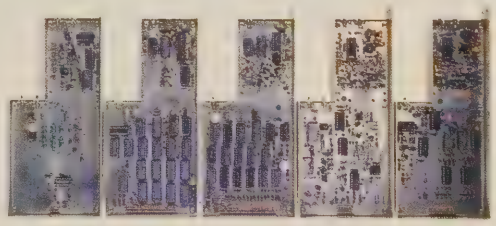
● **Synthesized Passband Tuning:** 1st. and 2nd. I-F tune in 10 Hz steps over ± 5 kHz range with respect to 1st. and 2nd. I-F filter passbands, a unique dual passband feature for maximum interference rejection. Controlled by tuning A/B.

● **Collins/Rockwell® Mechanical Filters:** For maximum selectivity and ultimate rejection performance. Demanded in most military/commercial applications. 2.1 kHz (USB/LSB), each selected for optimum performance on SSB, cascaded with front end VHF 8 pole crystal filter, active I.F. notch filter, passband tuning and noise blanker deliver 16 pole, 1.4:1 performance (6/60 dB) and add up to the most powerful anti-QRM system available.

● **Noise Blanker:** Pre I-F blanker with adjustable threshold and 80 dB dynamic range; gating effectively placed in receivcer RF path and triggered by pulsed noise such as over-the-horizon radar.

● **I-F Notch Filter:** Active 300 Hz notch in 2nd. I-F. Adjustable ± 1.5 kHz with 40 db rejection. Receiver AGC not affected by notched-signal.

● **High Power Transmit System:** Motorola® high power final amplifiers with 150 watt CW/SSB output or 200 watt option.



● **RF Speech Processing:** Clipped transmit RF signal is passed through mechanical and crystal filters for unequaled SSB talk power and elimination of unwanted intermodulation distortion products. This is a preferred process and considered superior to audio type processors.

● **QSK CW Full Break-In:** Vacuum relays and 200 Hz filter offer a superb full break in CW System.

● **Construction:** All circuit boards, including synthesizer modules, plug-in; ribbon cable interconnection and Minisert® sockets for transistor and IC replacement insure ease in self servicing; military and computer grade components used exclusively.

RECEIVER PERFORMANCE

Sensitivity: .25 uV (—118 dBm or better) for 10 dB S:N ratio at antenna input 1.6-30 MHz (2.1 kHz width in SSB).

Selectivity: 1st. I-F: 40.455 MHz ± 4kHz @ -6 dB, 1 dB ripple, 8 pole crystal filter.
2nd. I-F: 455 kHz mechanical filters, @ 3 dB.

Standard:	Optional:	
USB 2.1 kHz	CW2 375 Hz	AM 5.8 kHz
LSB 2.1 kHz	CW2 200 Hz	AFSK/LSB 300 Hz
CW1 1.9 kHz	(extra steep skirts)	(CF high tone pair)

Mixers: Specially developed, high-level, monolithic double balanced mixers with hot carrier diodes used in first and second mixer stages.

Intermodulation Distortion: (typical) 3rd. order input intercept point + 20 dBm for separated signals of 20 kHz;
2nd. order IMD is —80 dB.

Cross Modulation: Unmodulated wanted signal of 100 uV together with a modulated (30% at 1 kHz) unwanted signal of 100 mV spaced 30 kHz apart produces 10% Cross Mod.

Blocking: Attenuation of a wanted AF signal of 50 uV and caused by an unmodulated unwanted signal of 1V spaced 30 kHz apart then produces 3 dB blocking.

IF and Rejection: 80 dB

Synthesizer Phase Noise: Mean S/N ratio of 1st. L.O. (typical, reference to 1 Hz bandwidth); 90 dB measurement 1 kHz from carrier; 135 dB measurement 20 kHz from carrier.

TRANSMIT PERFORMANCE

Power Amplifier: Solid state, broadband 1.6 — 30 MHz 150 W or 200 W (high power option) CW/PEP output keydown all bands and modes. Automatic power cutback under excessive VSWR conditions. Heavy duty Hypersil® transformer for exceptional regulation and power. For continuous full power "key down" operation, blower option required.

Third Order Intermodulation Distortion: 25 dB below each of two tones at full PEP output.

Unwanted Signal Suppression: Carrier: —50 dB min; undesired sidebands, 1 kHz —55 dB min; harmonic (all: —40 dB 10 log of mean power output; mixer products: —50 min.

GENERAL

Frequency Coverage: 10 kHz to 29.9999 MHz receive; 10 kHz to 1.6 MHz at reduced sensitivity; 1.6 to 29.9999 MHz transmit.

Frequency Control: Memory provides **split tuning A/B** — using opto-electrical shaft encoder tuning in increments of 1 kHz 100 Hz and 10 Hz (180 kHz, 18 kHz, and 1800 Hz/360° respectively), selectable with front panel push buttons. **Tuning C** — preset frequency settable to 10 Hz with front panel lever switch; frequency entered by set button,display and BCD registers updated.

Memory:— frequencies stored in any of 9 memories, recalled for Tuning A/B frequencies with read push buttons; frequencies from Tuning A/B or C entered into memories with Auto Write or Write push button.

Stability: 1 ppm/month, 1 Hz/C°; 1 ppm after 15 min. warm-up at 25°C typical. For more demanding requirements, high stability reference oscillator option available — will meet military and commercial standards for specialized data transmissions.

Modes: USB, LSB, CW, AFSK, AM — receive. USB, LSB, CW AFSK/LSB — transmit.

Remote Computer Control: via rear panel 60 pin connector
1. BCD (1-2-4-8) 12 V CMOS parallel command for:
A. Frequency / handshake
B. Mode detection
C. Bandpass tuning
D. BFO tuning
2. Pulse input to drive shaft encoder counters
3. AGC output
4. Receiver mute command

Power Supply: Built-in heavy duty AC/DC supply. 115/230V ± 5%, 50 to 400 Hz. 12 to 15 VDC at 40 AMPS max., negative ground. 120 W max. in receive, 600W peak at full transmit input. Thermal and current overload protection.

Size: 16.2" wide; 7.8" high; 17.8" deep. **Weight:** 50 lbs

Specifications are subject to change without notice or obligation.
**Introductory price — $4995.00*

Black Canyon Industrial Park/8146 N. 23rd Ave. Phoenix, Arizona 85021 (602) 995-0608

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signal/one®

$4.00

Hints and Kinks for the RADIO AMATEUR

A compendium of practical ideas gleaned from the pages of *QST* and the *H&K* mailbox

PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

GENERAL OPERATING INSTRUCTIONS FOR THE MODEL CX7 DELUXE INTEGRATED STATION

JULY 1,1970

A DIVISION OF ECI(An NCR Subsidiary)

2200 ANVIL STREET N. ST. PETERSBURG, FLORIDA - 33710

A New Criterion for the Next Decade...

the Deluxe Integrated Station

signal/one

A Division of ECI (An NCR Subsidiary)

Preliminary Specifications -Model CX7

GENERAL

FREQUENCY COVERAGE: All amateur bands 1.8 - 30.0 MHz in full 1 MHz ranges. One additional 1 MHz band may be added in each of the three ranges, 2.0 - 3.0, 4.0 - 7.0 and 8.0 - 14.0 MHz, by supplying appropriate crystals.

VFO's: Identical permeability-tuned precision oscillators; 1 MHz tuning range with nominal 25 kHz per knob revolution.

READOUT: Accuracy, linearity, and resettability to 100 Hz at any point in any band after calibration at any 100 kHz checkpoint in that band. Integrated circuit digital frequency counter with miniature, high-intensity long-life Nixie display instantly shows actual frequency being received or transmitted.

SPOTTING: Push button provides audio beat note for spotting when using separate VFO's or Transmit Offset/ Transceive Mode.

STABILITY: Less than 100 Hz drift in first half-hour after turn-on; less than 50 Hz in any hour thereafter at fixed ambient.

T/R SWITCHING: Push-to-talk or fast-attack VOX; instantaneous break-in CW; fast key-up receiver recovery independent of AGC hang time. Isolated terminals for control of external amplifier.

CW KEYER: Built-in electronic keyer, 5-50 wpm. Separate jacks for keyer paddle and manual key.

FREQUENCY CONTROL MODES: Transceive with either VFO, "split" using both VFO's, transceive on either VFO plus independent receive-only on the other, or "Transmit Offset" transceive (transmit frequency tracks receiver and may be instantly offset up to plus or minus 3 kHz from receive frequency).

EMISSION MODES: SSB, CW, FSK, AM.

POWER SUPPLY: Built-in heavy-duty supply for 115/ 230 volts, 60 Hz. Silectron© transformer for exceptional regulation and power with very small size and weight. Requires approximately 100 watts receive, 400 watts peak at full input. 115/230 volt, 50-60 Hz export version available.

CONSTRUCTION: All critical circuitry (except P. A. and large power supply components) is modular on glass epoxy etched circuit boards.

SIZE AND WEIGHT: 16-1/4"w. x 7-1/4"h. x 14" deep overall, less feet. 25 pounds.

RECEIVING SYSTEM

ACTIVE DEVICES: Approximately 16 digital integrated circuits, 14 linear integrated circuits, 60 silicon transistors, one ceramic/metal P. A. tube.

SENSITIVITY: Better than 10 db signal-plus-noise-to-noise ratio for 1/3 microvolt input at 10 meters (2 kHz bandwidth).

SELECTIVITY: STANDARD (SSB) – 2 kHz @ -6db, 1.5:1 (6:60 db) shape factor (two cascaded 8-crystal lattice filters). OPTIONAL (CW/FSK) – 400 Hz with 4:1 shape factor, 300 Hz with 2:1 shape factor, 1200 Hz with 2:1 shape factor. Internal sockets for two optional filters; CW1 mode uses SSB selectivity, CW3 and FSK modes share one optional filter position.

ULTIMATE ATTENUATION: 80 db

IMAGE REJECTION: 80 db

IF REJECTION: 60 db

INTERNAL SPURS: Less than 1μv equivalent.

AGC: "Hang" type with selectable 100 ms or 1 second hang time; less than 6 db audio output change for signal level from 1 μv to 100 mv.

FRONT END DYNAMIC RANGE: A 10 microvolt desired signal will be modulated less than 10 % by an unwanted 10,000 μv signal 10 kHz away modulated 30% at 400 Hz, or by a similar 100,000 μv signal 5% removed.

AUDIO OUTPUT: 2 watts with less than 10% distortion.

IF SHIFT:* Actual IF adjustable up to plus or minus 2 kHz with respect to IF filter passband for interference rejection and receiver audio passband selection. Tracking error, zero.

DUAL RECEIVE:* Two channels usable separately or simultaneously; continuously variable relative RF gain control. Either channel may also be used for transceiving and the other for receive-only.

NOISE BLANKER: Pre-IF active blanker with adjustable threshold.

TRANSMITTING SYSTEM

TUNING: Pretuned bandpass output filter requires no adjustment when feeding nominal 50 ohm resistive load in amateur bands; manual tuning and loading for out-of-band or high SWR operation. Driver broadband 1.8 - 30.0 MHz.

POWER AMPLIFIER: Solid state, completely broad-band driver; rugged, ceramic-metal 8072 tetrode final amplifier conduction-coupled to massive extruded heat sink. 150 watts continuous dissipation rating at 25° C ambient.

POWER LEVEL: Nominal 300 watts PEP input, 150 watts PEP output all bands and modes. Output continuously adjustable down to less than 1 watt.

DUTY CYCLE: Continuous at full rated PEP input all modes.

CARRIER AND UNWANTED SIDEBAND SUPPRESSION: 60 db.

DISTORTION: Third-order intermodulation products more than 30 db below each of two equal tones at full rated output.

SPEECH PROCESSING: RF envelope clipper plus cascaded 8-crystal filters in SSB and compatible AM (USB with carrier) modes. Clipping adjustable 0-20 db nominal.

METERING: Clipping, drive level, plate and screen currents, forward and reflected RF power.

OPTIONAL ACCESSORIES

OPTIONAL ACCESSORIES: Standard and ultra-sharp CW filters, RTTY filter; available with CX7 or add-on later.

COMING SOON: Station console, miniature remote control head, mobile mount and DC inverter, general coverage (1.8 - 30.0 MHz) adapter, six and two meter transverter, carrying case ---

AND --- A UNIQUE NEW POWER AMPLIFIER TO COMPLETE THE "DELUXE INTEGRATED LEGAL-LIMIT STATION" -- Compact, rugged, versatile, and quiet .

SIGNAL/ONE

SIGNAL/ONE is a Division of Electronic Communications, Inc. – long a leader in the development and manufacture of advanced communications and control equipment and systems for government and industrial users. The sophisticated engineering and superb quality of SIGNAL/ONE products reflect their aerospace heritage. The backing of ECI -- one of the nation's one hundred largest electronics corporations and itself a subsidiary of world-wide, billion-dollar NCR -- provides the management and financial stability essential to sound growth and customer peace of mind. Yet the physical and operational separation of SIGNAL/ONE from the parent company permits a thoroughly competitive cost structure and devotion of undivided attention to the needs of amateur radio!

USER-ORIENTED DESIGN by engineers with long personal experience in ham radio - sophisticated application of up-to-the-minute technology -- direct personal service from inquiry through follow-up service -- these are some of the major reasons why SIGNAL/ONE offers amateur radio's greatest operating pleasure -- and best long-term investment value.

signal/one

*Patent Applied for

032-099

2200 Anvil Street N. St. Petersburg, Florida 33710

A New Criterion for the Next Decade...

the Deluxe Integrated Station

signal/one

A Division of ECI (An NCR Subsidiary)

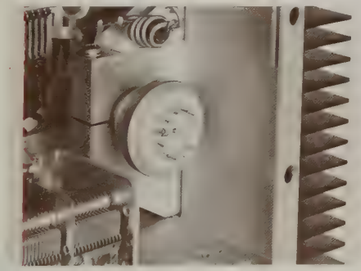
Performance

RF ENVELOPE CLIPPING delivers clean, crisp SSB with the talk power that no other type of speech processing can match. None of that mushiness typical of audio clipping and compression . . . This signal **penetrates**!

POST-CLIPPER PEAK OUTPUT CONTROL allows instant level adjustment for proper drive to any linear, and preserves signal quality right down to a watt or less!

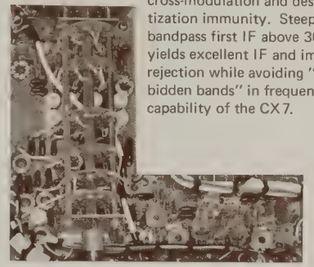
HIGH EFFECTIVE POWER OUTPUT . . . 300 watts PEP input combined with the high **average** power content of RF-clipped SSB makes the CX7 sound more like a KW . . . or several, when it's followed by a linear.

RUGGED CONDUCTION-COOLED FINAL AMPLIFIER has ample reserve power dissipation capability to run all day at full rated input . . . even on FSK. No more "key down" time limits. And its linearity is excellent.



The beryllia coupler block provides excellent electrical insulation, yet transfers anode heat to the extruded heat sink as efficiently as would a metallic aluminum block. The tube just loafs along, **cool** and **linear**.

DUAL-GATE MOSFET FRONT END provides outstanding sensitivity plus exceptional resistance to overload. Toroidal preselector helps achieve superb cross-modulation and desensitization immunity. Steep-skirted bandpass first IF above 30 MHz yields excellent IF and image rejection while avoiding "forbidden bands" in frequency capability of the CX7.



SPECTACULAR SELECTIVITY from **two cascaded** crystal filters is located **ahead of** most receiver gain, further enhancing dynamic range. Optional filters for CW or FSK are cascaded with one SSB filter, insuring unprecedented skirt selectivity and ultimate rejection in **all** modes.

IF SHIFT* control lets you move the received signal plus or minus 2kHz from nominal within the extremely steep-skirted IF filter passband to slice away QRM . . . attenuate a heterodyne by 50 db without affecting a desired signal only 500 Hz away!

HANG AGC levels out wide swings in signal strength, yet doesn't "pump" on normal conversation. Selectable "hang" time.

PRE-IF NOISE BLANKER gets to impulse noise before **it** can get to critical selective circuitry.

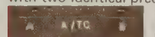
*Pat. Applied for

Convenience

INSTANT BAND CHANGE without tuneup is made possible by the CX7's broadband driver and bandpass P. A. output filters pretuned for each ham band from 160 through 10 meters. Yet badly mismatched or reactive loads (into which no broadband amplifier can deliver full power output and linearity) may be manually matched in a few seconds. Manual tuning also permits normal operation outside amateur bands.

DIRECT, INSTANTANEOUS FREQUENCY READ-OUT TO 100 Hz from the built-in integrated circuit digital counter. No more squinting, extrapolating, interpolating or ambiguous dial readings. The display shows exactly where you are - transmitting or receiving - instantly.

TRANSCEIVER-PLUS-RECEIVER PERFORMANCE with two identical precision VFO's, each tuning a full 1 MHz range plus ample end overlap for MARS, etc. SIGNAL/ONE's unique dual-receive system* permits listening simultaneously to two different frequencies anywhere in the band, with **relative** RF gain control - essential to avoid suppression of a weak signal by a stronger one. And you can transmit on either frequency, too.



PUSH-BUTTON SPOTTING lets you instantly check exact transmit frequency . . . read it at a glance . . . hear an audible beat if it's within 3 kHz of the receive frequency.

FAST, SILENT DIGITAL VOX means no more clanking relays or clipped syllables - designed to be **used.**

STATE-OF-THE-ART CW . . . at last!

- TRUE BREAK-IN (not just VOX)
- RAZOR-SHARP SELECTIVITY options
- INSTANT SPOTTING with either . . .
  - SPLIT FREQUENCY (dual VFO's) or
  - UNIQUE VARIABLE OFFSET, which lets you enjoy all the convenience of transceiving on CW, yet you can set the transmitter up to 3 kHz above or below the receiver with a flick of the wrist!

- CAREFULLY SHAPED RF carrier keying

- BUILT-IN DIGITAL KEYER

METERING OF ALL CRITICAL FUNCTIONS

. . . at the push of a button.

FREEDOM FROM CLUTTER . . . with all the essential "accessories" built in, there's no need for a tangle of patch cables.

EVERYTHING YOU NEED for flexible, high performance communications . . . in one sleek cabinet! (Just add an antenna and mike or key.)

Coverage

ALL HAM BANDS from 160 through 10 meters in full 1 MHz ranges plus overlap for MARS, WWV.

THREE SPARE BANDS for AF MARS, SWL, marine or other special use. 1.8 - 30 MHz CONTINUOUS with "General Coverage Adapter" (to be announced).

SIX AND TWO METERS with full CX7 capabilities - using "VHF Adapter" (to be announced).

ALL POPULAR MODES of operation . . .

- Upper and Lower sideband
- True break-in CW

- Compatible AM for VHF convenience
- FSK MODULATOR PLUS IF Shift* allows use with popular 2125/2975 Hz frequencies.

STANDARD "BUILT-INS" save cost, clutter, operating confusion.

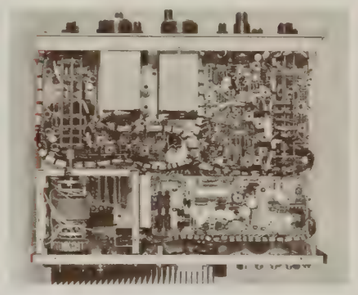
- Heavy duty AC power supply
- RF clipper
- Second Receiver capability
- CW keyer
- Precision frequency meter/calibrator
- Even a folding bail!

STATE-OF-THE-ART LEGAL-LIMIT LINEAR AMPLIFIER to match . . . coming soon.

Quality

INSTRUMENT GRADE COMPONENTS throughout . . . silicon semiconductors, long-life Nixies, rugged* ceramic switches in P. A., taut-band meter . . .

GLASS EPOXY ETCHED CIRCUIT BOARDS . . .



Same G-10 material used in military and space equipment . . . designed and manufactured by experts.

HIGH TEMPERATURE WIRING is soldering-iron-proof.

RUGGED POWER SUPPLY AND P.A. rated for continuous duty service.

HEAVY ALUMINUM CABINET and chassis, textured baked-epoxy enamel finish.

"It Speaks for Itself"

signal/one

Preliminary Specifications -Model CX7

GENERAL

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SPEECH PROCESSING: RF envelope clipper plus cascaded 8-crystal filters in SSB and compatible AM (USB with carrier) modes. Clipping adjustable 0-20 db nominal.

METERING: Clipping, drive level, plate and screen currents, forward and reflected RF power.

OPTIONAL ACCESSORIES

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*Patent Applied for

032-099

signal/one

2200 Anvil Street N. St. Petersburg, Florida 33710

GENERAL OPERATING INSTRUCTIONS FOR THE MODEL CX7 DELUXE INTEGRATED STATION

JULY 1,1970

A DIVISION OF ECI(An NCR Subsidiary)

2200 ANVIL STREET N. ST. PETERSBURG, FLORIDA - 33710

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SECTION I

GENERAL DESCRIPTION

1.1 INTRODUCTION

The Signal/One Model CX7, shown in Figure 1-1, is a self-contained, deluxe integrated station, designed for the professional-amateur radio operator. The construction technique utilizes solid-state circuitry throughout, with the exception of the Nixie tubes and the transmitter power amplifier stage which is a ceramic-metal tube. The Model CX7 is capable of operation in the SSB, CW, FSK and compatible AM mode. Frequency coverage includes all the amateur bands between 1.8 and 29.7 MHz with provisions for accepting spare crystals permitting operation in the non-amateur frequencies from 2 to 3, 4 to 7, or 8 to 14 MHz. Two separate VFO's provide the capability of simultaneously receiving two separate frequencies within the same band and transmitting on either. Tuning to the precise frequency is accomplished by observing the arabic numerals being indicated by the Nixie tubes while adjusting the VFO control for the desired display. Included as standard equipment are the DIGITAL KEYER, VOX, and ANTI-VOX, NOISE BLANKER, RF CLIPPER, and METERING of all critical functions. In reviewing the Model CX7 capabilities it might be discovered that the deluxe integrated station contains features which the average amateur can not presently utilize. However, as operating experience is gained, these features will provide the means to attain professionalism and will prove to be required necessities. The space age technology exhibited in the construction and circuitry will enhance the value of the Model CX7 for many years. Its characteristics far surpass other equipment claiming to set a standard of performance. Numerous amateurs have stated that they would choose not to be active at all if they had to operate without their Model CX7. The complete capabilities can best be understood by reviewing this entire manual.

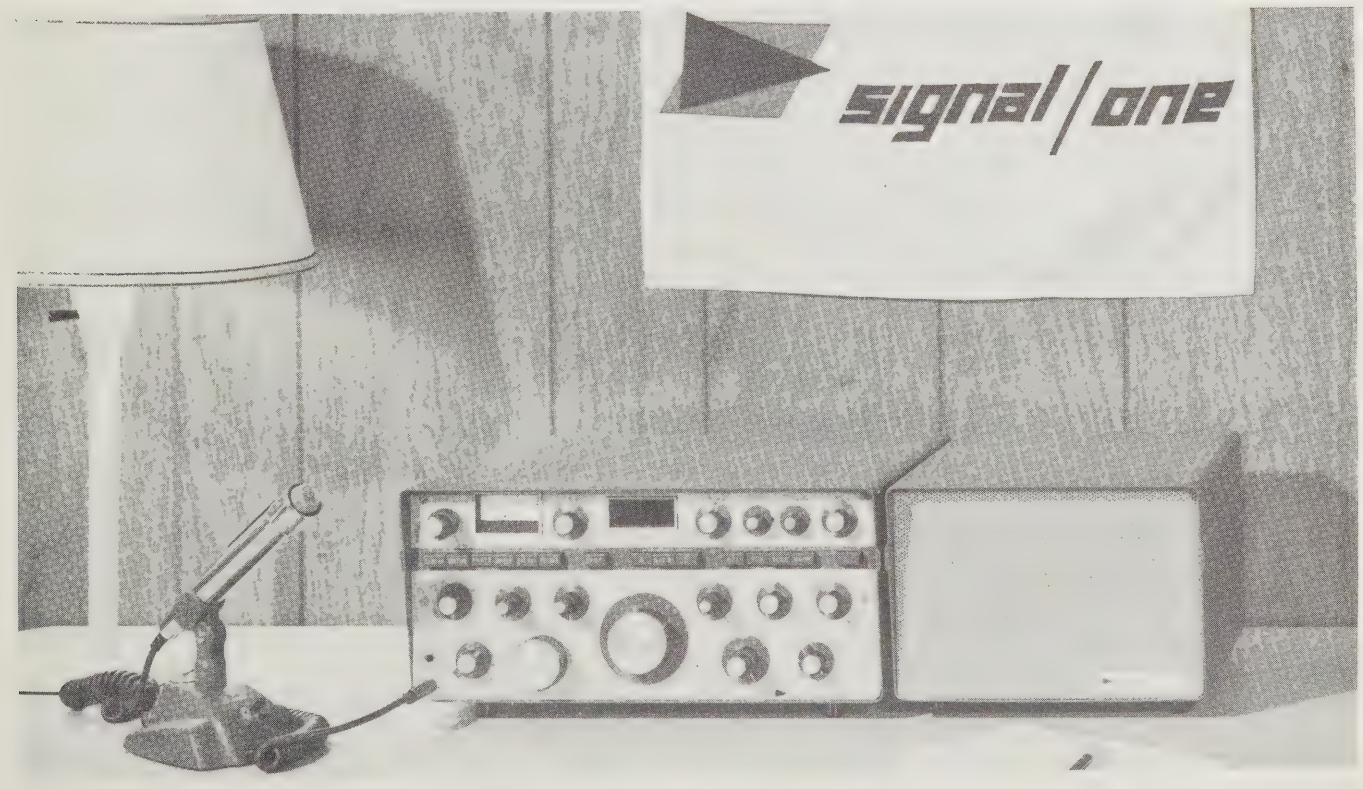
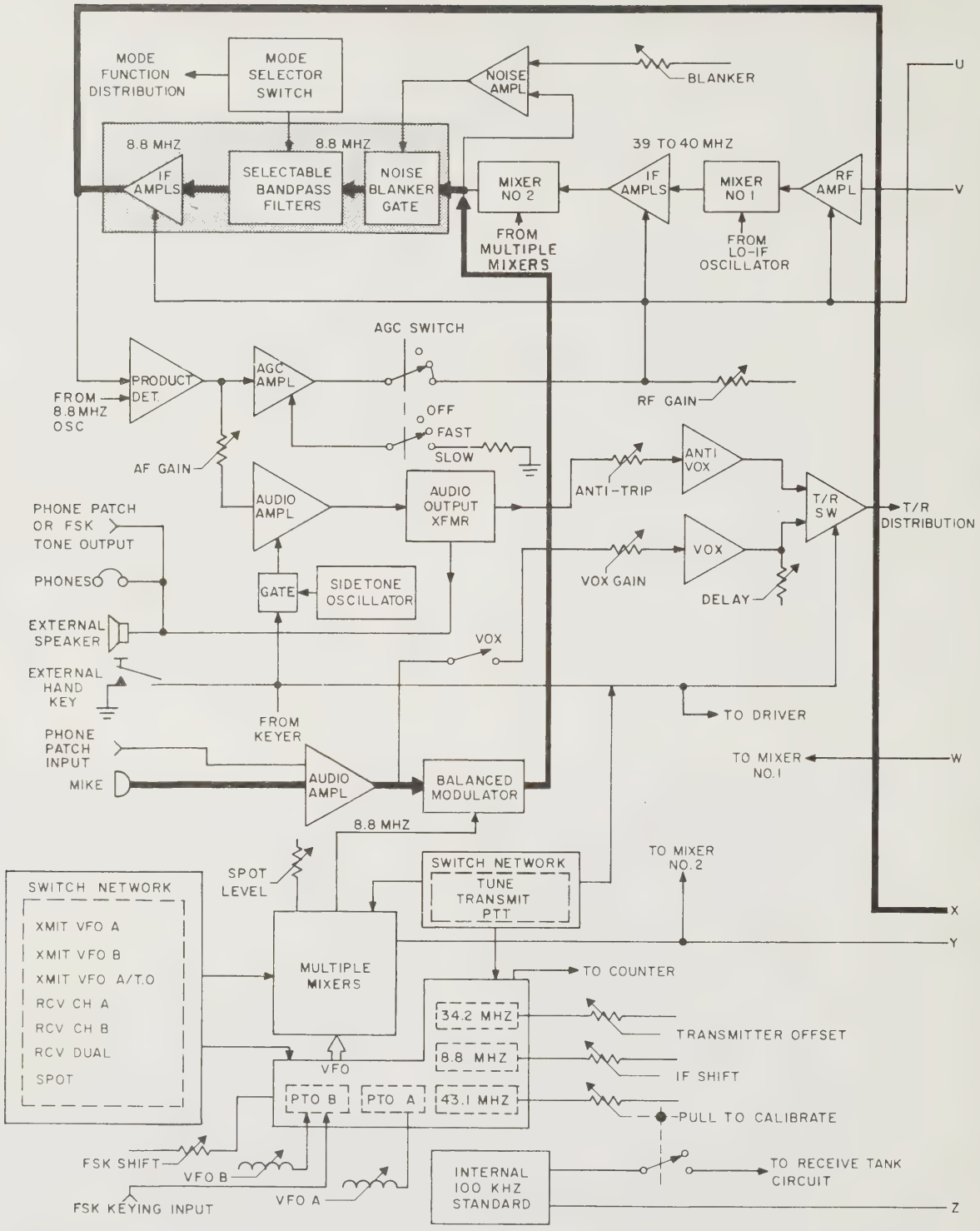
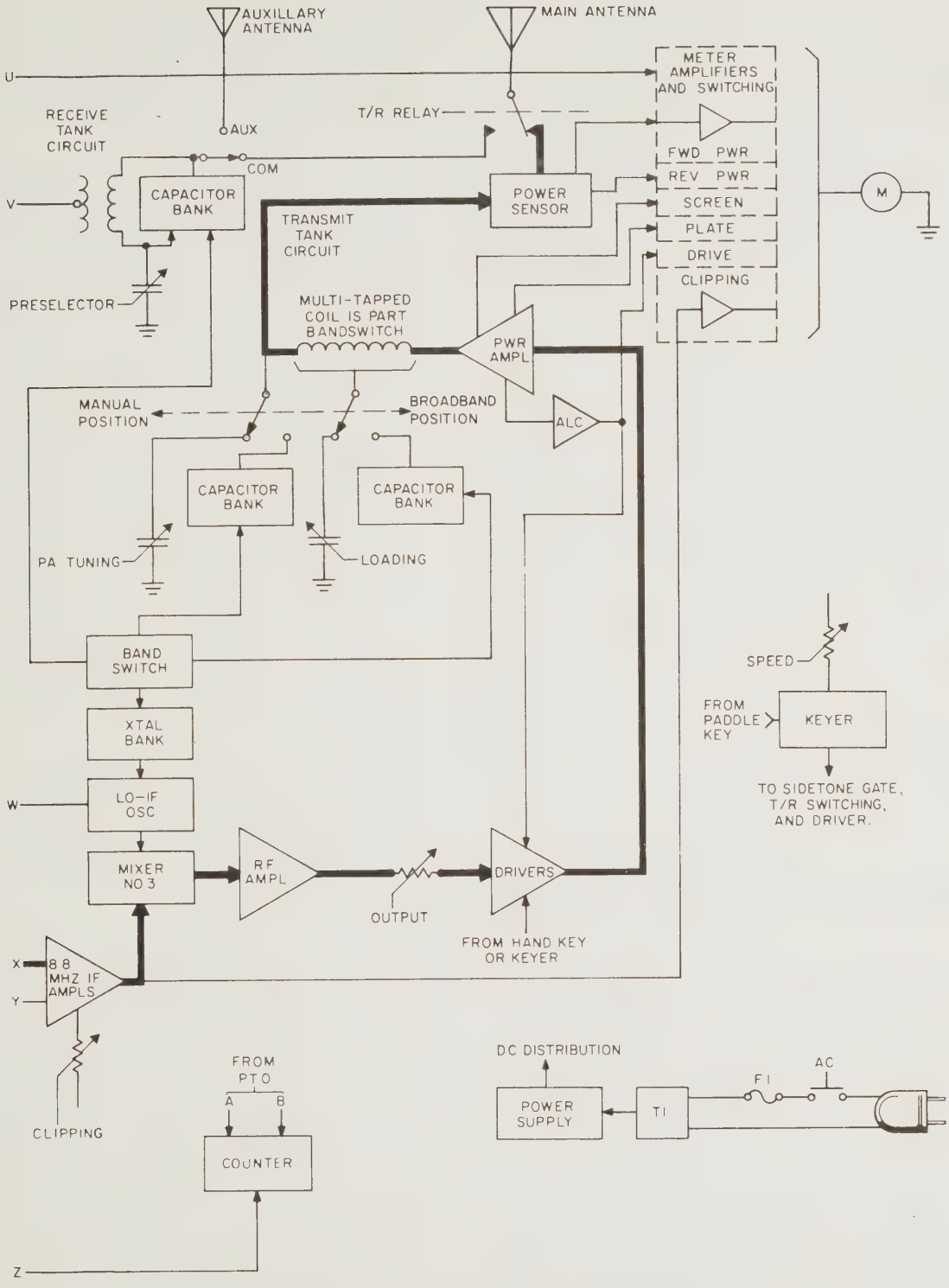


Figure 1-1. Model CX7 Deluxe Integrated Station



A Simplified Block Diagram of the Model CX7 is shown in Figure 1-2. While it is not the intent of this manual to cover the electronic theory of operation, the brief explanation that follows provides a basic concept that will aid in understanding the ensuing paragraphs: Stages that are common to both transmit and receive signal paths are shaded. The most common transmit signal path is depicted by the heavy, dark line. Where practical, operating switches and controls are shown with their interfacing stage. Transmit/Receive (T/R) command signals are used to disable the operation of circuits that are not desired for a specific mode. The circuitry beyond the



output of mixer no. 3 is broadband and operating at the actual transmit frequency. The receiver portion utilizes double conversion with 39 to 40 MHz and 8.8 MHz IF. Sideband, CW, and compatible AM demodulation is derived from the product detector. A VFO is comprised of a permeability tuned oscillator (PTO) and a 34.2 MHz oscillator. The scheme in which the VFO's and multiple mixers are utilized establishes the versatility of the Model CX7. Therefore, the majority of the switches and controls are centered around these stages. A detailed explanation of circuits is covered in the Model CX7 Deluxe Integrated Station Service Manual.

1.2 SPECIFICATIONS

1.2.1 General

a. Frequency Coverage. All amateur bands 1.8 to 30.0 MHz in full 1 MHz ranges. An additional 1 MHz band may be added in each of the three ranges, 2.0 to 3.0, 4.0 to 7.0, and 8.0 to 14.0 MHz, by installing appropriate crystals.

b. VFO's. Two identical, permeability-tuned precision oscillators; 1 MHz tuning range with nominal 25 kHz per knob revolution.

c. Readout. Accuracy, linearity, and resettability to 100 Hz at any point in any band after calibration at any 100 kHz checkpoint in that band. Integrated circuit digital frequency counter with miniature, high-intensity long-life Nixie display instantly shows actual frequency being received or transmitted.

d. Spotting. Push button provides audio beat note for spotting when using separate VFO's or Transmit Offset/Transceive Mode.

e. T/R Switching. Push-to-talk or fast-attack VOX; instantaneous break-in CW; fast key-up receiver recovery independent of AGC decay. Isolated terminals for control of external amplifier.

f. CW Keyer. Built-in electronic keyer, 5 to 60 wpm. Separate jacks for keyer paddle and manual key.

g. Frequency Control Modes. Transceive with either VFO, "split" using both VFO's, transceive on either VFO plus independent receive-only on the other, or "Transmit Offset" transceive (transmit frequency tracks receiver and may be instantly offset up to plus or minus 3 kHz from receive frequency).

h. Emission Modes. SSB, CW, FSK, compatible AM.

i. Power Supply. Built-in heavy-duty supply for 115/230 volts, 50 to 400 Hz. Silectron transformer for exceptional regulation and power with very small size and weight. Requires approximately 100 watts receive, 400 watts peak at full input.

j. Construction. All critical circuitry (except P.A. and large power supply components) is modular on glass epoxy etched circuit boards.

k. Size and Weight. 16-1/4"W, x 7-1/4"H, x 14" deep overall, less feet. 35 pounds.

1.2.2 Receiving System

a. Active Devices. 16 digital integrated circuits, 14 linear integrated circuits, 100 transistors (both bipolar and MOS FET) one ceramic metal P.A. tube.

b. Sensitivity. Better than 10 db signal-plus-noise-to-noise ratio for 1/3 microvolt input at 10 meters (2 kHz bandwidth).

c. Selectivity. Standard (SSB) - 2 kHz at -6 db, 1.5:1 (6:60 db) shape factor (two cascaded 8-crystal lattice filters). Optional: 1. Standard CW - 400 Hz with 4:1 shape factor; 2. Deluxe CW - 300 Hz with 2:1 shape factor; 3. Standard FSK - 1200 Hz with 2:1 shape factor (internal sockets provided for two optional filters).

d. Ultimate Attenuation. More than 60 db.

e. Image and IF Rejection. More than 60 db.

f. Internal Spurs. Less than 1 μv equivalent. (Except at 1.912 MHz.)

g. AGC. Fast attack with selectable 10 ms decay or 300 ms hang time; less than 6 db audio output change for signal level from 1 μv to 100 mv.

h. Front End Dynamic Range. A 10 microvolt desired signal will be modulated less than 10% by an unwanted 10,000 μv signal 10 kHz away modulated 30% at 400 Hz, or by a similar 100,000 μv signal 5% removed in frequency.

i. Audio Output. 1 watt.

j. IF Shift. Second IF adjustable up to plus or minus 2 kHz with respect to IF filter passband for interference rejection and receiver audio passband selection. Tracking error, zero.

k. Dual Receive. Two channels usable separately or simultaneously; continuously variable relative RF gain control. Either channel may be used for transceiving and the other for receive-only.

l. Noise Blanker. Pre-IF blanker with adjustable threshold.

1.2.3 Transmitting System

a. Tuning. Pretuned bandpass output filter requires no adjustment when feeding nominal 50-ohm resistive load in amateur bands; manual tuning and loading for out-of-band or high SWR operation. Driver broadband 1.8 to 30.0 MHz.

b. Power Amplifier. Solid-state, completely broad-band driver; rugged, ceramic-metal 8072 tetrode final amplifier conduction-coupled to massive extruded heat sink. 150 watts continuous dissipation rating at 25°C ambient.

c. Power Level. Nominal 300 watts PEP input, 150 watts PEP output all bands and modes below 28 MHz (130 watts above 28 MHz). Output continuously adjustable down to less than 1 watt.

d. Duty Cycle. Continuous at rated PEP input all modes.

e. Carrier and Unwanted Sideband Supression. 60 db.

f. Distortion. Third-order intermodulation products more than 30 db below each of two equal tones at full rated output.

g. Speech Processing. RF envelope clipper plus cascaded 8 pole crystal filters in SSB and compatible AM (USB with carrier) modes. Clipping adjustable 0 to 20 db nominal.

h. Metering. Clipping, drive level, plate and screen currents, forward and reflected RF power.

1.3 RECOMMENDED ACCESSORIES

a. Speaker. Only use the Signal/One Model CX7S speaker or one having the following characteristics:

1. Typical Size: 6 x 9 inches

2. Voice Coil: 3.2-ohm impedance

3. Magnet: 3.2-ounce Alnico V

4. Typical Rating: 8 watts

5. Frequency Range: 60 to 10,000 Hz or better.

b. Headphones

1. Impedance: Low

2. Frequency Range: 60 to 10,000 Hz or better.

c. Microphone. Only use the Signal/One Model CX7M microphone or one having the following characteristics:

1. Output Level: -57 db or better

2. Response: 60 to 10,000 kHz, or better

3. Impedance: High

4. Switching: With or without push-to-talk function.

d. Antenna. The Model CX7 is a deluxe integrated station of exceptional performance. It is designed for use with an antenna having an input impedance of 50 ohms. The use of random length wire antennas will degrade performance unless a good antenna coupler, with a 50-ohm output, is used. Do not use an antenna having a S.W.R. of more than 3:1.

1.4 OPTIONAL FILTERS AND CRYSTALS

The following optional filters and crystals may be purchased directly from Signal/One or Model CX7 distributors and can easily be installed by the Model CX7 owner following simple instructions supplied with the parts.

a. Standard CW Filter: 400 Hz bandpass

b. Deluxe CW Filter: 300 Hz bandpass

c. Standard FSK Filter: 1200 Hz bandpass

d. "A" Frequency Crystal: Provides capability to operate between 2.0 and 3.0 MHz frequency.

e. "B" Frequency Crystal: Provides the capability to operate in either the 4.0 to 5.0, 5.0 to 6.0 MHz, or 6.0 to 7.0 MHz frequency range. (Specify which range when ordering.)

f. "C" Frequency Crystal. Provides the capability to operate in either the 8.0 to 9.0, 9.0 to 10.0, 10.0 to 11.0, 11.0 to 12.0, 12.0 to 13.0, or 13.0 to 14.0 MHz frequency range. (Specify which range when ordering.)

1.5 PREPARATION FOR USE

1.5.1 Unpacking. Carefully lift the transceiver out of the packing material and examine it for visible damage. If the transceiver has been damaged in shipment, save the box and packing material, and notify the transportation company. Check the tuning controls and switches for freedom of action. Be sure to remove the accessory jumper plug and the power cord and plug from the packing material also. Fill out and mail the warrantee registration card.

1.5.2 Normal Operation Interconnections

a. Connect the accessory plug and power plug, with cord, to the applicable rear panel connector.

NOTE

The supplied accessory plug must be connected at all times because it contains jumper wires vital for the operation of the Model CX7. Do not connect the power plug to an ac outlet until the operating instructions have been reviewed. For the remaining connections, only use the type of accessories that possess the recommended electrical characteristics. Refer to Table 1-1 for the required type of mating plugs.

b. Perform either of the following:

1. Connect the headphones to the front panel "PHONES" jack.

2. Connect the loudspeaker to the rear panel "SPKR" connector.

c. Perform one of the following:

1. Connect the microphone to the front panel "MIKE" jack.

2. Connect the hand telegraph key to the rear panel "EXT KEY" jack.

3. Connect the paddle key to the rear panel "KEYER" jack.

d. Connect the main antenna utilized for both transmitting and receiving to the "ANTENNA" connector located immediately below the rear panel threaded bolt and wing nut terminal.

e. Connect an earth ground to the rear panel threaded bolt and wing nut terminal.

f. If it is desired to utilize an auxillary antenna for only receiving (in addition to the main antenna), connect that antenna to the "RCVR" connector to the immediate left of the rear panel threaded stud and wing nut terminal.

1.5.3 Special Purpose Interconnections

CAUTION

Accomplish the following interconnections with the Model CX7 power cord disconnected from an ac outlet.

1.5.3.1 Phone Patch Operation

a. Connect the headphones or speaker, microphone, antenna and earth ground as described in paragraph 1.5.2.

b. Connect the phone patch transmit lines to the rear panel "PATCH" connector.

c. Connect the phone patch receive lines to the rear panel "POWER" plug audio output pins 4 and 5.

1.5.3.2 FSK

a. Connect the antenna and earth ground as described in paragraph 1.5.2.

b. Connect a common ground between the rear panel earth ground stud and all the applicable external equipment.

c. Connect the teletypewriter transmit lines as follows:

1. Connect one of the wires to any convenient common ground point, such as, the rear panel earth ground stud or the teletypewriter frame.

2. Connect the remaining transmit line to the Model CX7 rear panel "POWER" plug pin 9.

d. Connect the receive lines from an external FSK tone converter to the Model CX7 rear panel "POWER" plug audio output pins 4 and 5.

e. Perform the remaining interconnections as recommended by the manufacturer of the FSK tone converter being utilized.

1.5.3.3 Linear Amplifier

a. Connect the microphone or telegraph key, speaker or headphones, and earth ground as described in paragraph 1.5.2.

b. Connect a common ground between the rear panel earth ground stud and the linear amplifier.

c. Connect a coaxial cable between the rear panel main antenna connector and the linear amplifier RF input.

d. Connect a cable between the rear panel "RLY" connector and the linear amplifier keyline input. (A ground will be present whenever the Model CX7 is keyed for a transmit condition.)

e. Connect a cable between the rear panel "ALC" connector and the linear amplifier automatic load control output.

f. Perform the remaining interconnections as recommended by the manufacturer of the linear amplifier being utilized.

Connector	Type of Plug
PHONES	Switchcraft No. 255
MIKE	Military Type PJ-068
EXT KEY	Switchcraft No. 255
KEYER	Switchcraft No. 297
H.V.	E. F. Johnson No. 105-300
PATCH	RCA Standard Phono Type
HI-IF	RCA Standard Phono Type
LO-IF	RCA Standard Phono Type
L.O.	RCA Standard Phono Type
SPKR	RCA Standard Phono Type
RLY	RCA Standard Phono Type
RCVR	RCA Standard Phono Type
J19	RCA Standard Phono Type
ALC	RCA Standard Phono Type
ANTENNA	Military Type PL-259

Table 1-1. Required Type of Mating Plugs

b. Establishing a Receive Mode. The receive mode is defined as switching the Model CX7 out of the transmit mode and enabling the operation of all the receiver circuits. Like the transmit mode, the receive mode can also be established by remote keying command signals (switching from a ground to a constant open) and properly positioning a front panel switch. Unlike the transmit mode that could be established by performing any one of the five operations listed in paragraph a, the receive mode can only be established after all the following operations have been completed:

1. Positioning the "PUSH-TO-TALK" switch on the microphone to the "OFF" or "LISTEN" position (when the "VOX" switch latched-in).

2. Permitting the telegraph key to remain in the open circuit condition.

3. Depressing the front panel control "PTT" or "VOX" switch to the latched-in position which causes the "TRANSMIT" or "TUNE" switch to eject to the extended (out or off) position.

c. Energizing (Turning ON) or Deenergizing (Turning OFF) the Model CX7.

It is good standard practice never to energize or deenergize the Model CX7 when it is keyed in a transmit mode. First, always establish the receive mode. The Model CX7 is deenergized when the front panel control "AC" switch is in the extended (out or off) position. The Model CX7 may be energized by simply depressing the "AC" switch to the latched-in position or deenergized by depressing the switch until it bottoms and then permitting it to release to the extended position. The Nixie tube "KHZ" display will illuminate whenever the Model CX7 is energized. In addition to indicating the bandspread setting, their illumination serves as a visual confidence indication of an energized Model CX7 condition.

d. Operation of Front Panel Push-Switches. The front panel push-switches for "METER", "TRANSMIT VFO", and "CONTROL" functions operate in a similar manner as the "AC" switch previously explained. However, they are deenergized using a different method. Other than the "SPOT" pushbutton or "AC" push-switch,

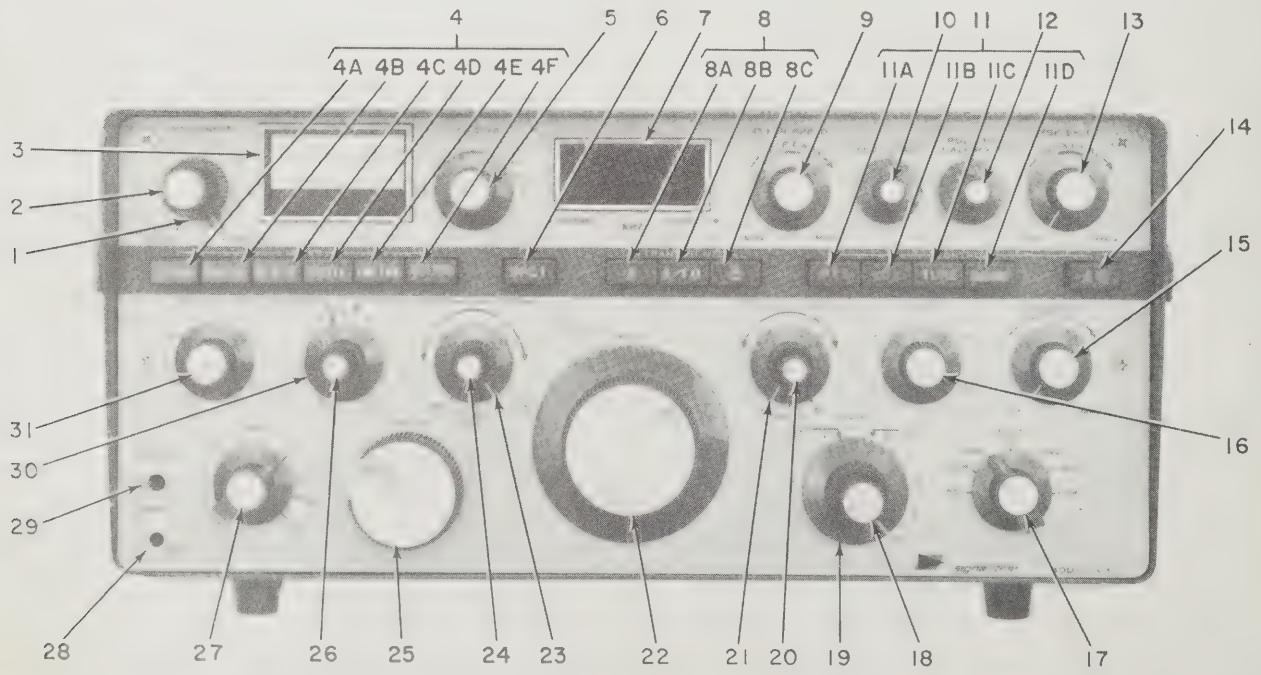


Figure 2-1. Model CX7 Front View

only one push-switch per group should be energized at a time. The energized position can also be referred to as the "DEPRESSED", "LATCHED-IN", "IN", "ON", or "SELECTED" position. Likewise, the deenergized position can also be referred to as the "OUT", "EXTENDED", or "RESET" position. To select the function listed on the applicable push-switch, depress the switch to the latched-in position.

CAUTION

Never simultaneously depress two or more of the grouped push-switches as each will latch-in resulting in many abnormal operating conditions.

To deenergize one of these grouped push-switches, simply depress one of the switches having an associated function. For example, if it is desired to deenergize the "TRANSMIT VFO-A" switch, depress either the "TRANSMIT VFO-B" or "A/T.O." push-switches. It should be noted that if a deenergized switch is not completely depressed, it may reset an energized switch, but may not seat itself to the latched-in position. This is recognizable by all the push-switches in an associated group being in the same extended position. This presents an abnormal operating condition resulting in various symptoms such as an improper meter indication or no power output. This may cause operator confusion so it is recommended that when meter or transmit VFO functions are not in use, the "PLATE" meter and the "A" transmit VFO switches be kept energized.

e. Operation of the Frequency Display and Normal Bandspread Tuning. The tuning position of the applicable "VFO-A" or "VFO-B" control within the bandspread is determined by observing the combined presentation for the four Nixie tubes. These tubes are always illuminated whenever the "AC" switch is energized. There is no mechanical linkage or gearing connecting the VFO control to the frequency display, consequently, what is being viewed is the output result of the electronic counter computer circuitry that analyzed the bandspread portion of the VFO output. It is perfectly normal for the right-hand tube to alternately display a numeral one digit higher or lower at a visibly blinking rate. For example, it may be alternately indicating between 9 and 0, 0 and 1, 1 and 2, 2 and 3, etc. When this occurs, it should be interpreted that it is 9-1/2, 1/2, 1-1/2, or 2-1/2, respectively. The display of the remaining tubes should be fixed, that is not

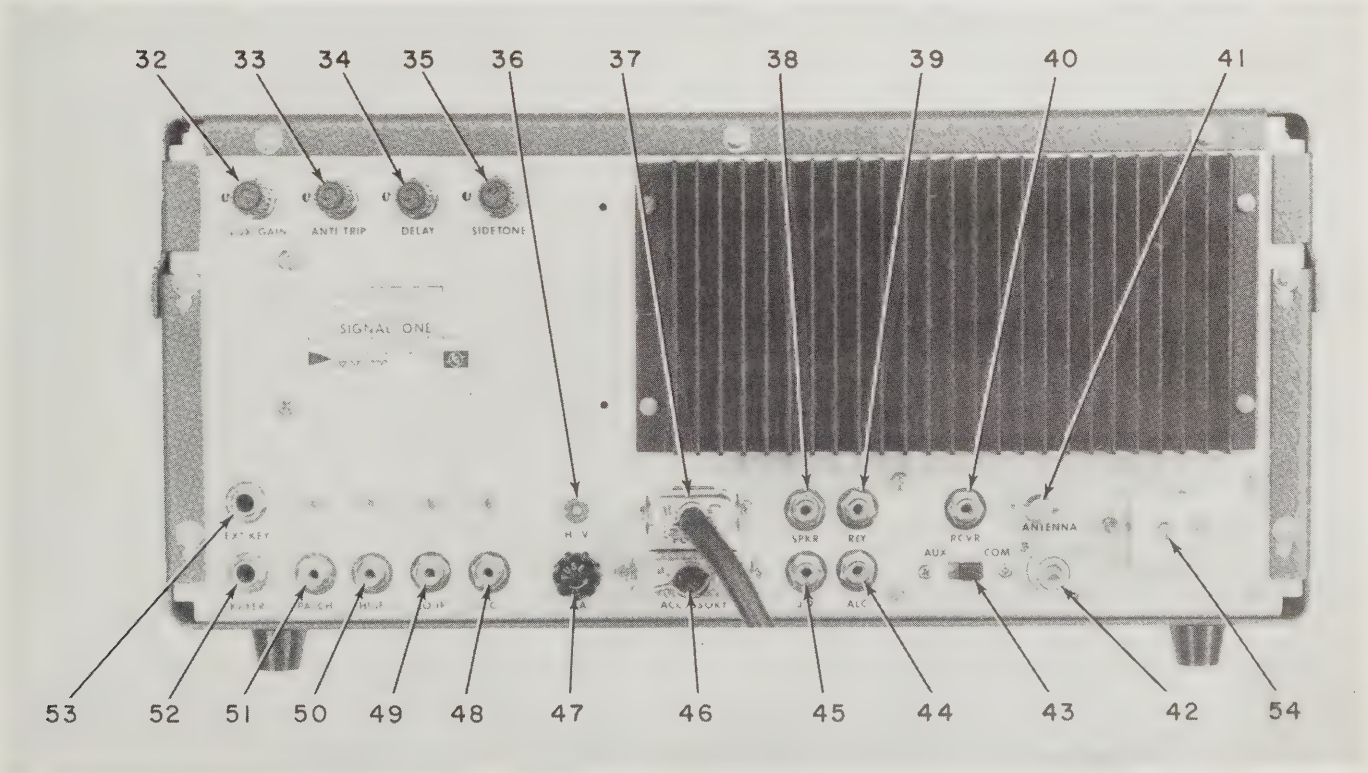


Figure 2-2. Model CX7 Rear View

changing if the VFO control is stationary. However, when the VFO is set to a frequency very near an even increment of ten, it is perfectly normal for two or more of the tubes to alternately display as previously described for the right-hand tube. Likewise, it may also appear that two of these digits are illuminated within the same tube. In this case, the display should change to a fixed indication when the applicable VFO control is rotated a few more degrees in either direction. There is approximately 50 complete 360° rotations of each VFO control from the full counterclockwise end to the full clockwise end. The end points of the "VFO A" and "VFO B" are noticeable by the start of a gradual increase in mechanical resistance of rotation and it should not be forced beyond this point for obvious reasons. Approximately between one half and two rotations from the full counterclockwise end is the beginning of the one megahertz bandspread and the frequency that should be displayed is "000.0". At this point, rotation to the left causes the over-range decimal point to illuminate and the display changes to ".999.9" or less depending on the final VFO control setting. If the "MHZ" band selector was set to "3", the display indication of ".999.9" would represent either a transmit or receive frequency of 2.999,900 MHz and a "000.0" indication would represent a frequency of 3.000,000 MHz. When the applicable VFO control is rotated to the right, the frequency increases approximately 25 kHz per revolution until the high end of the band is signified by a "999.9" frequency display. Further rotation to the right causes the over-range decimal point to again illuminate and the display changes to ".000.0" or greater, depending on the final VFO control setting. If the "MHZ" band selector was set to "3", the display indication of ".000.1" would represent a final frequency of 4.000,100 MHz. Each VFO is capable of being tuned approximately 25 kHz beyond the high (an indication of ".025.0") or low end (an indication of ".975.0") band edges. Therefore, caution must be used in VFO tuning in the transmit mode to prevent out of band transmission. It should always be remembered that the frequency being displayed is only the bandspread frequency and not the actual final receive, transmit, or entire VFO frequency. Therefore, the calibration procedure covered in paragraph 2.3.4 should periodically be performed. Changing the setting of the front panel "CALIBRATE", "TRANSMITTER OFFSET", or "IF SHIFT" control does not and was not intended to change the bandspread indication or bandspread spectrum. Whenever the transmit VFO "A/T.O." switch is latched-in, the "OFFSET" decimal point, on the right-hand side of the fourth Nixie tube from the left, illuminates. For example, if the display is indicating "345.6" (345.6 kHz) and then the "A/T.O." switch is depressed, the display changes to "345.6." (345.6 kHz). When reading the display, disregard the illumination of the "OFFSET" decimal point as its only purpose is to provide a visual reminder that the Model CX7 is in the transmit offset mode. If there is any doubt as to which VFO is being displayed, the question can be resolved by applying the following rules:

1. In the transmit mode, the display will indicate the VFO marked on the "TRANSMIT VFO" switch that is set to the latched-in position. (If the "A/T.O." switch is latched-in, VFO A is indicated.) If all three of these switches are in the out position, VFO A will be displayed.

2. In the receive mode, the display will indicate the VFO marked on the setting of the "RECEIVE CHANNEL" rotary selector switch (outer concentric control) except when in the "DUAL" position it will be VFO A.

f. Receive Mode Metering Indications. The front panel meter functions as an "S" meter regardless of the position of the "METER" switches, however, when the "SCREEN" switch is latched-in, the meter indicates slightly less than zero. Therefore, signal strength is usually measured with the "PLATE" switch latched-in. The meter has two scales. The red scale is used for "S" units 0 through 60. The black scale is used for transmitter mode indications. The "S" meter will move with the adjustment of the "RF GAIN" control, but will still indicate correctly with the rf gain set at less than maximum (if the received signal level is high enough to register on the "S" meter). For example, if the "RF GAIN" control is set for a no-signal meter indication of S-5, and the meter registers S-9 with a signal, then the receive signal is S-9. An S-9 indication is equivalent to a 50 microvolt signal at the main antenna connector.

g. Preexisting Switch and Control Positioning. As a convenience for the new CX7 owner, Signal/One positions all the switches and controls to specific settings prior to shipment. The positions were selected to help reduce initial operating errors and are listed in Table 2-2. The positioning sequence of each switch and control is repeated in detail in the following procedures for the benefit of those operating the Model CX7 for the first time.

Index No.	Item	Description
1	"BROADBAND/MANUAL" switch	The outer concentric two position rotary switch used in the transmit mode to select plate tank circuit capacitors. When the switch is set to "BROADBAND" no additional plate tank tuning is required after the desired band is selected. **WARNING** Do not change positions of the "BROADBAND/MANUAL" switch when the Model CX7 is keyed for a transmit condition, as this will result in damage to equipment, which is not covered by the warrantee.
2	"PA TUNING" control	The inner concentric continuous turn control used in the transmit mode to manually adjust the input capacitance in the plate tank. A "0" setting is maximum capacitance and "10" is minimum. Prior to effectively operating this control, the "BROADBAND/MANUAL" switch (Index No. 1) must be first positioned to "MANUAL."
3	Meter	The meter indication is dependent upon which "METER" switch is depressed. When in the transmit mode, the top scale "0" through "5" is used for a reference indication. The bottom scale "0" through "60" indicates received signal strength when in the receive mode regardless of "METER" switch position.
4	"METER" switches	The "METER" switches are used to select the desired parameter to be measured. The proper switch must be depressed (energized or the "IN" position). For the meter to indicate the desired transmit function, the six two-position meter switches are mechanically interconnected so that only one may be depressed at any one time. The switch is deenergized when in the extended (OUT) position. To place all "METER" switches in the deenergized position, simply depress any deenergized meter switch half way in and allow it to return to the extended position.
4a	"CLIPPING" switch	When depressed, permits the meter to indicate the relative transmit signal level in the 8.8 MHz IF stage as determined by the "CLIPPING" control (Index No. 30). A deflection of S-3 during voice peaks represents 10 db of clipping and

Table 2-1. Controls, Connectors, and Indicators (Sheet 1 of 9)

Index No.	Item	Description
4a (Cont)		full scale deflection during voice peaks is equivalent to 20 db of clipping.
4b	"DRIVE" switch	When depressed, permits the meter to indicate the relative automatic level control (ALC) signal bias for the RF Driver board. A midscale deflection is equivalent to approximately 6 db of ALC action.
4c	"PLATE" switch	When depressed, permits the meter to indicate the relative plate current drawn from the high voltage rectifier circuit on the Power Supply board. A full scale deflection is equivalent to 500 ma.
4d	"SCREEN" switch	When depressed, permits the meter to indicate the relative screen current drawn from the +300 Vdc rectifier circuit on the Power Supply board. A full scale deflection is equivalent to 50 ma.
4e	"FWD PWR" switch	When depressed, permits the meter to indicate the relative power output being applied to the rear panel antenna connector. A full scale deflection is equivalent to 200 watts. (See conversion Table 2-4).
4f	"REV PWR" switch	When depressed, permits the meter to indicate the relative power reflected from the rear panel antenna connector to the plate tank circuit. A full scale deflection is equivalent to 200 watts. (See conversion Table 2-4).
5	"LOADING"	A control used in the transmit mode to manually adjust capacitance within the plate tank. It is adjustable for any setting on or between "0" and "10." A "0" setting is maximum capacitance and "10" is minimum. Prior to effectively operating this control, the "BROADBAND/MANUAL" switch (Index No. 1) must be first positioned to "MANUAL."
6	"SPOT" pushbutton	A pushbutton switch that enables the operation of a mixer stage located on the IF board when manually held in the depressed position. The pushbutton automatically returns to the deenergized position when released. When depressed, a tone is present if the transmit and receive frequency are within 3 kHz of each other.
7	"KHZ" display	A four tube numeric readout, that is representative of bandspread tuning. Either channel A or B tuning may be displayed depending upon the setting of the "TRANSMIT VFO" switches

Table 2-1. Controls, Connectors, and Indicators (Sheet 2 of 9)

Index No.	Item	Description
7 (Cont)		(Index No. 8a, b, c), "SPOT" pushbutton (Index No. 6), and "RECEIVE CHANNEL" switch (Index No. 21). The decimal point on the third tube from the left is permanently displayed. The decimal point on the fourth tube from the left is displayed whenever the "TRANSMIT VFO-A/T.O." switch (Index No. 8b) is depressed. The decimal point on the first tube on the left is automatically displayed whenever the counter is operating in an overrange condition.
8	"TRANSMIT VFO" switches	The "TRANSMIT VFO" switches are used to select the desired VFO for a transmit condition. If the Model CX7 is not keyed for a transmit condition, VFO selection is determined by the "RECEIVE CHANNEL" switch (Index No. 21). The three switches are mechanically interconnected and only one should be depressed at any one time. In order to transmit, one of these switches must be energized at all times. Failure to do so will result in no rf drive to stimulate power output.
8a	"A" switch	When depressed, selects VFO A to be transmitted.
8b	"A/T.O." switch	When depressed, selects VFO A to be transmitted at a frequency which can be slightly offset from the normal VFO A frequency. The amount of offset is determined by the "TRANSMITTER OFFSET" control (Index No. 24).
8c	"B" switch	When depressed, selects VFO B to be transmitted.
9	"KEYER SPEED" control	A potentiometer that varies the frequency of oscillator in the electronic keyer thereby changing the transmitted speed of the dot or dash cw output. The rate of speed is approximately 5 WPM when positioned to "MIN" and 60 WPM when positioned to "MAX".
10	"SPOT LEVEL" control	A potentiometer that varies the attenuation of the audio output produced when the "SPOT" pushbutton (Index No. 6) was depressed.
11	"CONTROL" switches	These four two-position "CONTROL" switches are used to select specific type of modes. Only one switch should be depressed (energized or the "IN" position) at any one time. Each switch is deenergized when in the extended (OUT) position.

Table 2-1. Controls, Connectors, and Indicators (Sheet 3 of 9)

Index No.	Item	Description
11a	"PTT" switch	When depressed, this switch only serves the mechanical function of resetting the associated switches (Index No. 11b, 11c, and 11d) to the deenergized position thereby placing the Model CX7 in the receive mode.
11b	"VOX" switch	When depressed, the VOX mode is established and the presence of voice signals will automatically enable the operation of the transmitter circuits. The absence of voice signals will cause automatic switching to the receive mode. The function of this switch is dependent upon the setting of the "VOX GAIN" control (Index No. 32) and the "ANTI-TRIP" control (Index No. 33).
11c	"TUNE" switch	When depressed, it enables the operation of the transmitter circuits and causes an internal CW signal to drive the PA stage resulting in power output. This permits manual power amplifier tuning or internal adjustments to be performed under test conditions.
11d	"TRANSMIT" switch	When depressed, it enables the operation of the transmitter circuits. Power output will not be developed until a CW or modulating signal is supplied from an external source.
12	"PULL TO CALIBRATE" control	A switch/potentiometer assembly that applies the output of the 100 kHz standard to the receiver front end when in the pulled out position. When this control is rotated it changes the frequency of the 43.1 MHz oscillator on the BFO board.
13	"FSK SHIFT" control	A potentiometer that changes one of the local oscillator frequencies used in generating VFO B when the appropriate rear panel interconnections have been wired.
14	"AC" switch	A two position switch that applies ac power to the Model CX7 when depressed to the "IN" position. Power may be removed by further depressing the switch until it releases and positions to the extended (OUT) setting. This switch also supplies an open or a ground to the rear panel power connector (Index No. 37) for external logic switching purposes.
15	"BLANKER" control	A potentiometer that changes the threshold of the noise blanker amplifier. The noise blanker circuit does not function when in a transmit

Table 2-1. Controls, Connectors, and Indicators (Sheet 4 of 9)

Index No.	Item	Description
15 (Cont)		mode or when the control is set to "OFF". Increasing the control to the appropriate setting cancels rf noise pulses in the receive signal path.
16	"IF SHIFT" control	A potentiometer that is used in the receive mode to change the frequency of the 8.8 MHz oscillator on the BFO board. Its function permits an interfering signal to be shifted out of passband of the IF filters. At the "0" position, the IF frequency is centered in the IF filter passband. The numerical settings of "-2", "-1", "+1", and "+2", represent the frequency in kHz from the center of the IF filter passband. This control does not affect the local oscillator frequency in the transmit mode.
17	"MODE" selector	A seven position rotary switch that determines the operating mode for reception and transmission. The "AM" (amplitude modulation), "LSB" (lower sideband), "USB" (upper sideband), and "CW1" (continuous wave number one) positions select standard functions. The "CW2" (continuous wave number two), "CW3" (continuous wave number three), and "FSK" (frequency shift keying) positions select special functions and will result in no output unless optional filters are installed. The receive signal characteristics which result from the "AM", "USB", and "CW1" positions are effectively the same quality. Likewise, the "LSB" signal is similar except that it is the lower sideband. The signal characteristics for the remaining positions are dependent upon the passband of the optional filters.
18	"GAIN-AF" control	The inner concentric control is a potentiometer that varies the attenuation of the product detector audio output. It is an independent portion of a dual-potentiometer assembly. The other independent portion is the "GAIN-RF" control (Index No. 19).
19	"GAIN-RF" control	The outer concentric control is a potentiometer that varies the operating bias of the Front End and IF board RF stages.
20	"RECEIVE CHANNEL" balance control	The inner concentric control is a potentiometer that varies the operating bias of the "A" and "B" mixers on the IF board, when in the receive mode. It is a portion of a potentiometer/switch assembly. The effect of its operation is dependent upon the setting of the switch portion

Table 2-1. Controls, Connectors, and Indicators (Sheet 5 of 9)

Index No.	Item	Description
20 (Cont)		(Index No. 21) which must be set to "DUAL". When set to the midrange position, the output of both mixers will be the same level. When positioned toward either the "A" or "B" settings, the applicable mixer output will be higher or lower in level.
21	"RECEIVE CHANNEL" balance control	The outer concentric control is a three position rotary switch. The "A" position permits only the VFO A operation, the "B" position permits only the VFO B operation and the "DUAL" position permits the operation of both. The switch functions are only applicable in the receive mode and do not interfere with or determine the selection of the transmit VFO.
22	"VFO A" control	A control that permits tuning an inductor located in VFO A. Its movement covers the 1 MHz bandspread range with approximately 25 kHz change per revolution. The exact position in the band, to within 100 Hz, is indicated on the Nixie tube display (Index No. 7) depending on the specific setting of the "TRANSMIT VFO" switches (Index No. 8) or the "RECEIVE CHANNEL" switch (Index No. 21).
23	"AGC" switch	A three position rotary switch that determines the operation of the automatic gain control (AGC) circuit used in the receive mode. The "OFF" position opens the AGC output signal path and the remaining two positions complete the signal path. The "FAST" position selects a fast time constant AGC voltage decay and the "SLOW" position selects a slow "HANG" time constant AGC voltage decay.
24	"TRANSMITTER OFFSET" control	The inner concentric control is a potentiometer that permits the offset oscillator frequency to be varied. It must be used in conjunction with the "TRANSMIT VFO-A/T.O." switch (Index No. 8b). The midrange position is the center frequency. Rotation from midrange to the left permits the VFO A frequency to be decreased proportionally to a maximum of -3 kHz. Rotation from midrange to the right permits the VFO A frequency to be increased proportionally to a maximum of +3 kHz.
25	"VFO B" control	A control that permits tuning an inductor located in VFO B. It performs a similar function as previously explained for the "VFO A" control (Index No. 22).

Table 2-1. Controls, Connectors, and Indicators (Sheet 6 of 9)

Index No.	Item	Description
26	"OUTPUT" control	The inner concentric control is an independent portion of a dual potentiometer assembly. It is used in the transmit mode to vary the attenuation of the excitation input to the RF Driver board thereby controlling the amount of RF power output. The "0" setting is representative of minimum drive and "10" is maximum.
27	"MHZ" band selector	A ten position rotary selector switch used to select the desired frequency band. The "A", "B", or "C" positions will result in no output unless optional crystals have been installed for nonamateur band use. The remaining positions represent the specific low end frequency of the selected band. **WARNING** Do not change positions of the "MHZ" band selector when the Model CX7 is keyed for a transmit condition, as this will result in damage to the equipment, which is not covered by the warrantee.
28	"MIKE" connector	A jack connector that permits a high impedance microphone audio output and push-to-talk lines to be applied to the Model CX7.
29	"PHONES" connector	A jack connector that permits low impedance headphone connections to the Model CX7. When the headphone plug is inserted, the speaker is disconnected from the circuit.
30	"CLIPPING" control	The outer concentric control is an independent portion of a dual potentiometer assembly that varies the operating bias of an IF amplifier stage in the transmit signal path. The "0" setting is representative of minimum clipping and "10" is maximum. This control is used in conjunction with the "CLIPPING" meter switch (Index No.4 a).
31	"PRESELECTOR" control	A control used in the receive mode to adjust capacitance in the rf input tuned circuit. Its only function is to trim the front end after changing bands. The "1" setting represents minimum capacitance and "12" represents maximum.

Table 2-1. Controls, Connectors, and Indicators (Sheet 7 of 9)

Index No.	Item	Description
32	"VOX-GAIN" control	A potentiometer that varies the attenuation of the audio input being applied to the VOX amplifier circuit. Its function is to adjust the threshold level of speech that keys the Model CX7 for a transmit condition.
33	"ANTI-TRIP" control	A potentiometer that varies the attenuation of the speaker audio signal being applied to the anti-vox amplifier circuit input. Its function is to adjust the threshold level of demodulated audio that keeps the Model CX7 keyed for a receive condition.
34	"DELAY" control	A potentiometer that varies the resistance in a time constant circuit on the audio board. When using VOX keying in the transmit mode, its function is to adjust the length of time that the transmitter stays keyed after the operator stops speaking.
35	"SIDETONE" control	A potentiometer that varies the attenuation of the sidetone oscillator audio output when using CW emission in the transmit mode.
36	"HV" connector	A connector, with protective insert, providing a +1500 Vdc output for test and accessory use.
37	"POWER" connector	A connector providing multiple outputs and inputs for test and accessory use in addition to providing primary input power connections.
38	"SPKR" connector	A connector providing an audio output for external speaker use.
39	"RLY" connector	A connector providing a ground whenever the Model CX7 reed relay closes or the "TRANSMIT" switch (Index No. 11d) is energized. The output is for test and accessory use.
40	"RCVR" connector	A connector for applying an antenna to only the receiver input.
41	Ground connector	A threaded bolt with wing nut provided for earth ground connections.
42	"ANTENNA" connector	A connector for applying the main antenna to both transmitter output and receiver input.
43	"AUX-COM" switch	A two position slide switch for selecting the receiver antenna. The "COM" position connects the main "ANTENNA" connector (Index No. 42) to the receiver input. The "AUX" position connects the alternate "RCVR" connector (Index No. 40) to the receiver input.

Table 2-1. Controls, Connectors, and Indicators (Sheet 8 of 9)

Index No.	Item	Description
44	"ALC" connector	A connector providing an ALC output for test and accessory use.
45	"J19" connector	A spare connector.
46	"ACCESSORY" connector	A connector providing multiple outputs and inputs for test and accessory use.
47	"5A" fuse holder	A fuse holder for the 5A slow blow fuse in the primary power line.
48	"L.O." connector	A connector providing an output from the Front End board local oscillator for test and accessory use.
49	"LO-IF" connector	A connector providing an 8.8 MHz (25 kHz bandpass) output from the IF board for test and accessory use. The output level is dependent upon the setting of the "BLANKER" control (Index No.15).
50	"HI-IF" connector	A connector providing a 39 to 40 MHz bandpass output from the Front End board for test and accessory use.
51	"PATCH" connector	A connector for applying a phone patch transmit input to the Model CX7.
52	"KEYER" connector	A connector for applying the output of an external paddle key to the Model CX7.
53	"EXT KEY" connector	A connector for applying the output of an external telegraph key to Model CX7.
54	Bandswitch Shaft Extention	Bandswitch shaft extention permits the installation of an external one pole, 2 to 12 position ceramic wafer (Oak part no. 399150-JC), thereby, selecting different antennas or linear amplifiers by positioning the "MHz" band selector (Index No.27).

Table 2-1. Controls, Connectors, and Indicators (Sheet 9 of 9)

Control	Position
Broadband/Manual	*Manual
PA Tuning	6
Matching	6.5
Meter	Plate
PRESELECTOR	2
Clipping	3
Output	0
Transmitter Offset	*Center
AGC	Slow
Bandswitch	*3
Transmit VFO	A
Keyer Speed	Minimum
Spot Level	1/4 Range
Calibrator	*OFF (in)
FSK Shift	Minimum
Control	PTT
Receive Channel (outer control)	A
Receive Channel (inner control)	CCW
IF Shift	0
Blanker	OFF
RF Gain	10
AF Gain	3
Mode	USB
Rear Panel	
VOX Gain	1/2 Range
Anti-Trip	1/4 Range
Delay	CCW
Sidetone	1/4 Range

*See applicable WARNING or CAUTION note on following page.

Table 2-2. Switch and Control Positioning

WARNING

1. Never change positions of the "BROADBAND/MANUAL" switch when the Model CX7 is keyed for a transmit condition, as this will result in damage to the equipment which is not covered by the waran-tee.

2. Never change positions of the "MHZ" band selector switch when the Model CX7 is keyed for a transmit condition, as this will result in damage to the equipment, which is not covered by the warrantee.

3. High voltage is always present on the rear panel auxillary and test connectors. Use extreme caution at all times.

4. Do not ground the Phillips-head screws located immediately above the rear panel "PATCH, HI-IF, LO-IF, or L.O." connectors as this will result in damage (not covered by warantee) to the equipment because they are at a low voltage potential above DC ground.

CAUTION

1. Do not indescriminately rotate the front panel "CALIBRATE" control or otherwise change its setting in either the receive mode or transmit mode, when positioned in or when pulled out as this will result in the improper VFO frequency unless it is adjusted in accordance with paragraph 2.3.4.

2. Use caution when adjusting the "TRANSMITTER OFFSET" control near each band edge as this may result in transmission outside of the amateur bands.

2.3.2 Single Channel Receive Mode Operation. Do not energize the "AC" switch until specified in the following procedure, subparagraph g.

a. Check that the Model CX7 is not being externally keyed for a transmit condition.

b. Depress the front panel "PTT" switch.

c. Check the position of the rear panel "AUX-COM" slide switch: If the antenna is connected to the connector immediately below the wing nut, set the switch to the "COM" position. This permits reception on the same antenna used for transmitting. If a different antenna is used for reception, and if it connected to the connector immediately above the slide switch, set the switch to the "AUX" position.

d. Check that either the speaker or headphones are connected to the applicable connector. (If the headphones are utilized, the operation of the speaker will be inhibited.)

e. Check that the rear panel "ACCESSORY" and "POWER" connectors and that the antenna and ground are securely fastened.

NOTE

The supplied accessory and power plugs must be utilized because they complete specific jumper connections required for the normal operation of the Model CX7.

f. Check that the power cord is connected to an ac outlet.

g. Depress the "AC" switch to the latched-in position and allow a few minutes for crystal frequency stabilization. Check that the Nixie tubes are illuminated and presenting a normal display.

h. Set the "MODE" rotary selector switch to the "USB" position.

i. Set the "MHZ" band selector to the "3" position.

j. Set the "RECEIVE CHANNEL" switch (outer concentric control) to the "A" position.

k. Set the AGC switch (outer concentric control) to the "SLOW" position.

l. Depress the "PLATE" meter switch to the latched-in position. Any meter indication will now represent relative received signal strength as an "S" meter.

m. Position the "RF GAIN" control (outer concentric control) for maximum gain to the "10" setting.

n. Position the "IF SHIFT" control to the "0" setting.

o. Position the "NOISE BLANKER" control to the "OFF" setting.

p. Position the "AF GAIN" control (inner concentric control) to a setting that provides a comfortable audio level for random noise.

q. Position the "PRESELECTOR" for either a peak audio noise or "S" meter indication.

r. Tune the "VFO-A" control until a desired station is monitored and adjust the remaining reception conditioning controls using the procedures covered in paragraphs 2.3.2.1 through 2.3.2.3, as required. When tuning to a new station, always remember to first set the "IF SHIFT" control to the "0" position and the "BLANKER" control to the "OFF" position.

s. If it is desired to use the other VFO instead, set the "RECEIVE CHANNEL" switch (outer concentric control) to the "B" position and tune in the desired station using the "VFO-B" control.

2.3.2.1 Operation of the "AGC" Switch. For CW reception, the "AGC" switch should be set to the "FAST" position. Some operators may prefer to utilize this switch in the "OFF" position and manually simulate AGC by adjusting the "RF GAIN" control. (However, the "OFF" position is normally not used except for performing alignment or conducting special tests.)

For SSB or AM reception, the "AGC" switch should be set to the "SLOW" position so that the AGC voltage will not sag between syllables.

2.3.2.2 Operation of the "IF SHIFT" Control. The "IF SHIFT" control is operated in the same manner for all modes of reception. This control should always be set to the "0" position while tuning in a station with the VFO control. If another station is interfering with the station you wish to receive, adjust the "IF SHIFT" control until the unwanted station is eliminated. This is very easy to accomplish in the cw mode with no apparent change in signal characteristics, however, in voice mode, the signal quality might be sacrificed as the control setting may also reduce either the high or low frequency response of the desired station.

2.3.2.3 Operation of the "BLANKER" Control. The "BLANKER" control is operated in the same manner for all modes of reception. When the "BLANKER" control is positioned to the full counterclockwise end, no noise blanking is performed. If objectionable noise pulses are being received along with the station you are monitoring, slowly advance the "BLANKER" control in the clockwise direction until the noise pulses have been reduced sufficiently. If this control is advanced too far, clipping and distortion will also occur in the station you are monitoring. Therefore, the minimum setting consistent with adequate limiting obtains the best effective results.

2.3.3 Dual Channel Receive Mode Operation. The same operating instructions that were specified for the single channel receive mode operation are also applicable for dual channel receive mode operation with minor exceptions. During this mode, the signal conditioning controls, such as "AGC", "IF SHIFT", "BLANKER", "RF GAIN", and "AF GAIN" cannot be used to command one channel without affecting the other channel. Therefore, the normal benefits derived from positioning these controls may have to be compromised during the dual receive mode operation. The following steps, a through d, comprise the basic procedure for establishing the dual channel receive mode:

a. Set the "RECEIVE CHANNEL" rotary selector switch (outer concentric control) to the "A" position and tune in the desired station using the "VFO-A" control.

b. Set the "RECEIVE CHANNEL" rotary selector switch (outer concentric control) to the "B" position and tune in a different station, that is within the same band, using the "VFO-B" control.

c. Set the "RECEIVE CHANNEL" rotary selector switch (outer concentric control) to the "DUAL" position. It is unlikely that both stations have the same signal strength, consequently the audio volume of the channel A and B will be unequal.

d. Adjust the "RECEIVE CHANNEL" potentiometer (inner concentric control) to a position that balances the audio outputs so they are equal. This control cannot increase the basic audio level, it can only reduce the existing level of the loudest station. Gradually rotating this control to the counterclockwise end proportionally decreases the output of channel B until it is completely eliminated. Likewise, gradually rotating this control to the clockwise end proportionally

decreases the output of channel A until it is completely eliminated. The "AF-GAIN" control (inner concentric control) will change the basic volume of both stations.

e. Tuning to a new station on either channel can be accomplished by using the same procedure as previously described in steps a through d.

Special cases may exist when one of the channels must be constantly monitored. If this is known prior to establishing the basic dual receive condition, use channel B for the constantly monitored channel because only the channel A VFO frequency is displayed. However, if it is desired to observe the VFO B display or tune to a new station with the aid of the display, perform the following procedures:

1. Position the "TRANSMIT VFO-B" switch to the latched-in position (frequency display still indicates VFO A).

2. Adjust the "SPOT LEVEL" control to the full counterclockwise position.

3. Depress the "SPOT" pushbutton to the "IN" position and hold (frequency display now indicates VFO B).

4. Upon completion of using the VFO B display, release the "SPOT" pushbutton (frequency display returns to VFO A).

2.3.4 Calibration Using the "PULL TO CALIBRATE" Control. Calibration using this control permits compensating for an incorrect intermediate frequency that is used in both the receive and transmit mode of operation. Care must be exhibited when utilizing this control because it is actively in the circuit for both the "IN" and "OUT" positions and could conceivably cause the calibration to be misadjusted by accident. The recommended calibration procedure is as follows:

a. Position the front panel switches and controls for the single channel receive mode of operation using either receive channel A or B.

b. Set the "MODE" rotary selector switch to the "USB" position.

c. Position the "IF SHIFT" control to the "-1.5" position.

d. Set the "MHZ" band selector switch to the desired band.

e. Tune the applicable "VFO A" or "VFO B" control for a front panel frequency display of "000.0" or any multiple 100 KHZ point.

f. Pull out the "PULL TO CALIBRATE" control and check for the presence of an audio zero beat caused by a harmonic of the 100 kHz internal frequency standard output.

NOTE

If the zero beat is not present, tune the applicable VFO control to determine if it occurs within ±100 Hz of the "000.0" indication which signifies that calibration is within limits.

2.3.4.1 Compensation. Prior to performing any adjustments, check the calibration on the remaining bands to determine if similar symptoms exist and then perform one of the following compensations as required:

a. If the calibration is off on all bands by the same amount and direction, perform the calibration adjustment by first tuning either the applicable "VFO A" or "VFO B" control for a front panel frequency display of "000.0" and rotate the "PULL TO CALIBRATE" control to the position where the zero beat occurs. All bands have now been simultaneously calibrated.

b. In some cases, calibration may not be the same on all bands due to unequal aging of internal oscillator components. If desired, the "PULL TO CALIBRATE" control can be adjusted for frequency compensation for only a specific band in a similar manner as covered in previous subparagraph a. When a different band is selected, then it too will require calibration.

2.3.4.2 Calibration Using "WWV"

a. Set the "MODE" rotary selector switch to the "USB" position.

b. Position the "IF SHIFT" control to the "-1.5" position.

c. Set the "MHZ" band selector to the "14" position.

d. Tune in "WWV" on the high end of the band using the applicable "VFO A" and "VFO B" control.

e. Rotate the "PULL TO CALIBRATE" control to the position that produces a front panel frequency display of ".000.0" (15 MHz).

2.3.4.3 Calibrating Internal 100 kHz Standard.

a. Repeat the steps covered in paragraph 2.3.4.2(a) through (d).

b. Pull out the "PULL TO CALIBRATE" control.

c. Insert a small screwdriver through the special cut-out on the top right-hand side of the Model CX7 cover (refer to Figure 2-3 for exact location) and adjust capacitor C31 for a zero beat. This is best accomplished when WWV is transmitting a steady carrier. The zero beat is caused by 150th harmonic of the internal standard and the carrier of WWV.

2.4 Transmit Mode Operating Procedures

2.4.1 General. The general instructions covered in paragraph 2.4.1a through d are stated for information purposes and should not be performed at this time. Much of the general information specified in the receive mode general information paragraph 2.3.1a through g is also applicable and should be reviewed before actually operating the Model CX7 in the transmit mode. It is suggested that the operating procedure covered in paragraph 2.4.2 be performed initially with the Model CX7 connected to a dummy load, having a 50-ohm impedance, until the operator achieves the proper feel for the PA tuning and loading adjustment reactions.

a. Control of Power Output. The master control for power output is the "OUTPUT" potentiometer which varies RF drive to the final amplifier. When the transmitter is keyed, the "0" setting should present very little or essentially no power output. More than adequate drive is usually available, therefore, the majority of the controlling range normally utilized is between the "0" and "3" setting. It is safe to operate this control at settings higher than "3" as long as the screen current does not exceed an indication of "1.2" (12 MA) and the plate current does not exceed an indication of "3.3" (330 MA). The control should always be returned to the "0" setting before selecting a new frequency or prior to terminating final transmitter operation. During normal operation the Model CX7 should not be adjusted for a power output greater than 150 watts as the heat dissipation characteristics of the power amplifier will be exceeded.

b. Transmit Mode Metering Indications. The front panel meter is used for monitoring various transmit mode functions and provides a reference indication pertaining to the applicable meter switch that is set to the latched-in position. The different monitoring functions can be selected with or without power output present because all indications are relative, that is, the meter is not

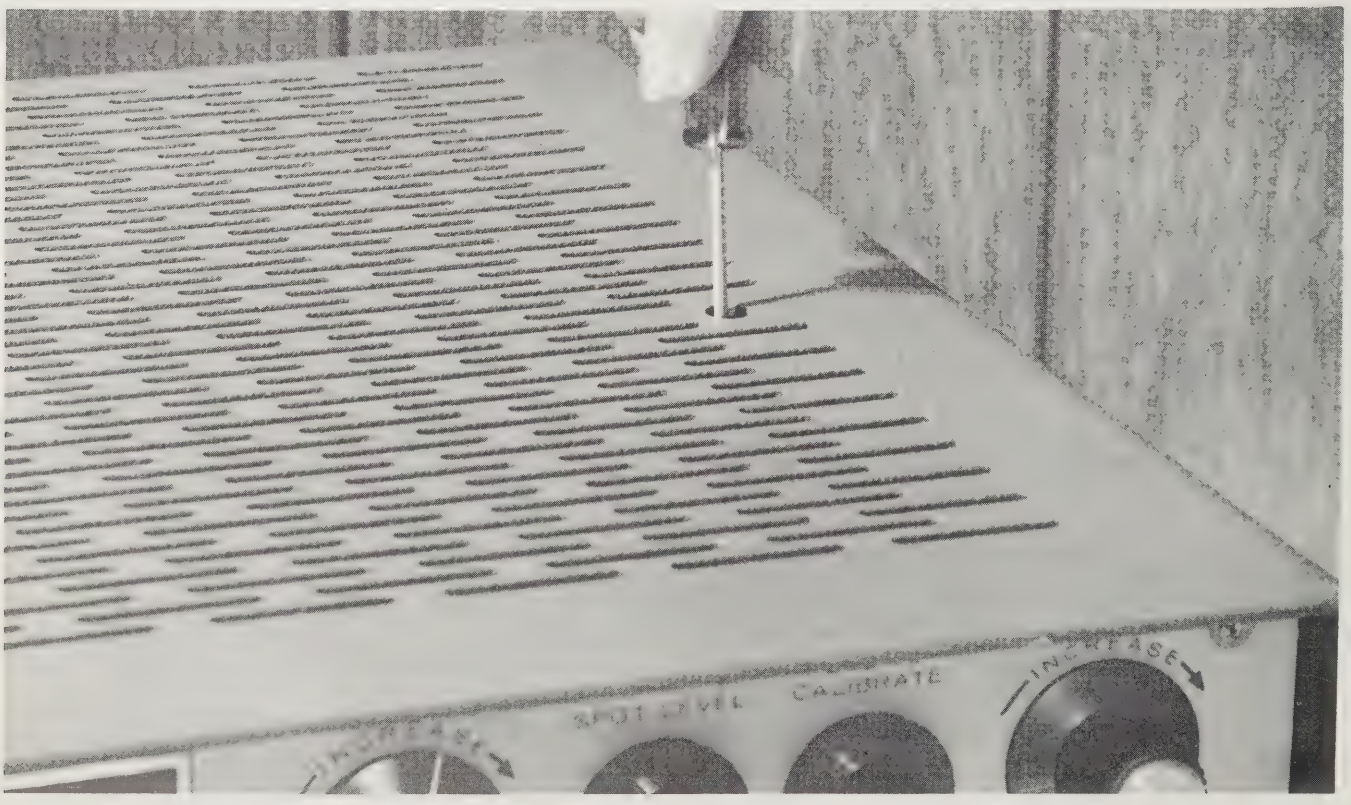


Figure 2-3. Capacitor C31 Location

directly in the circuit path of the function being monitored and will not interrupt transmitter operations. All the levels of parameters being measured, except clipping, are indicated on the black scale which is divided in units 0 through 5 with 4 subdivisions between each major division. The amount of clipping is indicated on the red scale. If all the meter switches are in the extended-out position, no transmit functions are monitored. Nominal and maximum meter indications for CW are listed in Table 2-3 for quick reference. The relationship between the meter indication and the actual value can be determined from the following:

1. Clipping. A nonlinear indication on the red scale that requires translating to determine an approximate amount of voice peak clipping. An S-3 to S-4 indication represents 10 DB of clipping and full scale represents 20 DB.

2. Drive. A nonlinear indication on the black scale that is used for reference only. Actual values are not significant as this indication represents the approximate amount of the composit automatic level control (ALC) derived from either or both control and screen grid currents. An indication signifies that an ALC voltage is automatically reducing the RF drive so that the control and screen grid currents are not permitted to exceed their safe ratings.

3. Plate. A linear indication on the black scale that signifies the actual value of plate current. Each major division mark represents 100 milliamperes. Therefore, a full scale indication would be 500 milliamperes.

4. Screen. A linear indication on the black scale that signifies the actual value of screen current. Each major division represents 10 milliamperes. Therefore, a full scale indication would be 50 milliamperes. It is permissible for this indication to deflect in the negative direction during transmission or power amplifier tuning.

5. FWD PWR. A nonlinear indication on the black scale that requires translating to determine the actual amount of forward power output. To calculate the power output from the meter indication, refer to Table 2-4.

Function	Indications		
	Idling At Zero Watts	At 150 Watts	Maximum Safe Values
PLATE	1 (100 MA)	2 to 3 (200 to 300 MA)	3.3 (330 MA)
SCREEN	0	Less than 1.2 (12 MA)	1.2 (12 MA)
FWD PWR	0	4.2 (150 Watts)	4.2+ (150 Watts +) During voice or CW operation or 150 Watts maximum during continuous duty
REV PWR	0	See NOTE 2	See NOTE 2
DRIVE	0	Less than 5	Less than 5
CLIPPING	See NOTE 1	See NOTE 1	See NOTE 1

*NOTES:

1. Not applicable, see paragraph 2.4.4.3.
2. In BROADBAND MODE: Not more than the value which results in an SWR of 1.5:1. In MANUAL MODE: Not more than the value which results in an SWR of 3:1.

Table 2-3. Nominal Meter Indications

6. REV PWR. A nonlinear indication on the black scale that requires translating to determine the actual amount of reverse (reflected) power. Meter divisions for both forward or reverse indications represent the same value in watts. Reverse power can be calculated using Table 2-4.

c. Operation of the "BROADBAND/MANUAL" Switch. Two power amplifier tuning modes are provided in the choice of "BROADBAND/MANUAL" switch positions. The determining factor in choosing tuning modes is governed by characteristics resulting from the quality of antenna system being used. At any frequency where the standing wave ratio is less than 1.5:1, the broadband mode can be used. The advantage of using the broadband mode is that the "PA TUNING" and "LOADING" controls do not have to be adjusted thus reducing the tuning time.

WARNING

Do not change positions of the "BROADBAND/MANUAL" switch when the Model CX7 is keyed for a transmit condition. Do not operate in the broadband mode whenever the VSWR exceeds 1.5:1. Always tune the power amplifier stage in the manual mode. Failure to observe any of the above instructions will result in damage to the equipment which is not covered by the warantee.

d. VFO Channel Selection and VFO Tuning. Three separate VFO channels are provided for the transmit mode: "VFO A", "VFO A/T.O.", and "VFO B". The Model CX7 can transmit on any one of these at any specific time. (Dual channel operation is only for the receive mode.) The VFO channels may be selected with or without power output present. To operate with "VFO A", depress the "TRANSMIT-VFO A" switch to the latched-in position and use the "VFO A" control for bandspread tuning. To operate with "VFO B", depress the "TRANSMIT-VFO B" switch to the latched-in position and use the "VFO B" control for bandspread tuning. To operate with "VFO A/T.O.", depress the "TRANSMIT-VFO A/T.O." switch to the latched-in position and use the "VFO A" control for bandspread tuning. The actual "VFO A/T.O." channel frequency may be offset from the "VFO A" frequency being displayed by the Nixie tubes by a constant specific amount determined by the setting of the "TRANSMITTER OFFSET" control (up to 3 kHz). (The frequency offset tracks with the rotation of the "VFO A" tuning control.) The decimal point in the right-hand Nixie tube illuminates to provide a visual warning that the frequency readout is not indicating the actual transmitted frequency whenever the "VFO A/T.O." channel is being used.

Meter Indication	Equivalent Watts
0.0	0
0.2	1
0.4	2
0.6	4
0.8	7
1.0	10
1.2	14
1.4	19
1.6	25
1.8	33
2.0	40
2.2	48
2.4	57
2.6	66
2.8	75
3.0	85
3.2	100
3.4	108
3.6	118
3.8	130
4.0	140
4.2	150
4.4	166
4.6	180
4.8	190
5.0	200

Table 2-4. Determining Actual Power

WARNING

It is possible to transmit outside the authorized band by using the "VFO A/T.O." channel at the band edge and subsequently offsetting in the wrong direction. Therefore, tuning precautions should be observed.

e. Antenna System Checkout. Damage to the Model CX7 caused by a faulty antenna system can be prevented by adjusting for a low forward power meter indication of 1 (10 watts) and measuring the reverse power. If the reverse power meter indication is higher than 0.4 (2 watts), check for an open in the antenna system connections.

2.4.2 Tune Mode Operation. (Do not energize the "AC" switch until specified to do so in the following procedure, subparagraph f.) Note that in this initial procedure, the transmitter is not keyed until reaching subparagraph *m*.

a. Check that the Model CX7 is not being externally keyed for a transmit condition.

b. Depress the front panel "PTT" switch, thereby ensuring that a receive mode will be established.

c. Check that either the speaker or headphones and either the mike or the key are connected to the applicable connector. (If the headphones are utilized, the operation of the speaker will be inhibited.)

d. Check that the rear panel "ACCESSORY" and "POWER" connectors and that the main antenna and ground connections are securely fastened.

NOTE

The supplied accessory and power plugs must be utilized because they complete specific jumper connections required for the normal operation of the Model CX7.

e. Check that the power cord is connected to an ac outlet.

f. Depress the "AC" switch to the latched-in position and allow a few minutes for crystal frequency stabilization. Check that the Nixie tubes are illuminated and presenting a normal display.

g. Set the "MODE" rotary selector switch to either the "AM", "LSB", "USB", or "CW1" position.

NOTE

The tune mode is not dependent upon any particular "MODE" switch setting.

WARNING

Do not change positions of the "MHZ" band selector when the Model CX7 is keyed for a transmit condition, as this will result in damage to the equipment which is not covered by the warantee.

h. Set the "MHZ" band selector to the "3" position.

i. Set both the "OUTPUT" control (inner concentric control) and "CLIPPING" control (outer concentric control) to the "0" position.

j. Set the "BROADBAND/MANUAL" switch to the "MANUAL" position.

k. Depress the "TRANSMIT VFO A" switch to the latched-in position.

l. Depress the "PLATE" meter switch to the latched-in position.

m. Set the "LOADING" control to the mid-range position between the "6" and "7" settings.

n. Set the "PA TUNING" control (inner concentric control) to the "6" position.

o. Depress the "TUNE" switch to the latched-in position. The transmitter is now keyed and minimum power output is present. The front panel meter should indicate "1" (100 MA) for an idling plate current (80 to 100 MA is normal).

p. With the "OUTPUT" control in the "0" position, tune the "VFO A" control to a frequency in the middle of the band (or the frequency you wish to transmit on).

q. Depress the "SCREEN" switch to the latched-in position. The front panel meter should indicate "0" (no screen current should be present at this time).

r. Tune the power amplifier stage in accordance with the following steps 1 through 9:

NOTE

The overall objective of this procedure is to obtain an RF power output of 150 watts or more, a minimum plate current in the 200 to 300 MA range, and a minimum screen current of less than 12 MA.

1. Rotate the "OUTPUT" control from 0 to 1 and back to 0 while observing the screen meter indication. If the screen current increased in level, adjust the "OUTPUT" control until the meter indicates "1.0" (10 MA) without advancing the "OUTPUT" control beyond "3". If the screen did not change or if it decreased below "0", depress the "PLATE" switch to the latched-in position and adjust the "OUTPUT" control until the meter indicates "2.6" (260 MA).

2. Depress the "FWD PWR" switch to the latched-in position and note the forward power indication on the meter for future reference. Little or no power may be present.

3. Depress the "PLATE" switch to the latched-in position and adjust the "PA TUNING" (inner concentric control) for the lowest point in the dip of the plate meter indication while not permitting it to exceed "3.3" (330 MA). The dip should occur between "2" and "2.6" (200 and 260 MA).

4. Depress the "FWD PWR" switch to the latched-in position and note the forward power indication on the meter for future reference. An increase in power above that noted in the previous measurement should be observed.

5. Depress the "SCREEN" switch to the latched-in position and adjust the "LOADING" control for the lowest point in the dip of the screen meter indication while not permitting it to exceed "1.2" (12 MA). The dip should occur between "0" and "0.4" (0 and 4 MA) on the meter.

NOTE

When plate current is dipped, screen current will peak. Therefore, during the remaining steps, the "PA TUNING" and "LOADING" controls can be adjusted for a peak screen current as long as the screen current is not permitted to exceed 12 MA.

6. Depress the "FWD PWR" switch to the latched-in position and note the forward power indication on the meter for future reference. The power output should be higher in level than that noted in step 4. If not, repeat steps 3 through 6 until an increase to at least "3.8" (130 watts) is noted.

7. Depress the "PLATE" switch to the latched-in position and slightly advance the "OUTPUT" control for a plate meter indication of "3".

8. Depress the "SCREEN" switch to the latched-in position and check that the screen meter indication is still less than "1.2".

9. Depress the "FWD PWR" switch to the latched-in position and note the forward power indication on the meter. The indication should be at least "4.2" which represents a power out of 150 watts. If it is higher, reduce the setting of the "OUTPUT" control to the point where "4.2" is indicated. If the initial indication was less than "4.2", slightly and in unison, rock the "PA TUNING" (inner concentric control) and the "LOADING" controls in both opposing and both unopposing directions to locate a final setting where a minor change in either won't adversely affect the respective plate or screen current indication while keeping the adjustment parameters within the specified limits.

NOTE

A forward power output of 130 watts is satisfactory for any frequency above 28 MHz.

s. The tuning mode is now complete. Adjust the "OUTPUT" control for the forward power level that you wish to conduct transmission with and depress the "PTT" switch, thereby placing the Model CX7 in the receive mode.

2.4.3 Normal Transmit Channel Operation

2.4.3.1 Operating with a VSWR Less than 1.5:1

a. Establish a receive mode.

b. Select the desired band with the "MHZ" rotary selector switch.

c. Tune the applicable "VFO A" or "VFO B" control to the desired bandspread frequency.

d. Depress the applicable "TRANSMIT VFO A" or "TRANSMIT VFO B" switch to the latched-in position.

e. Set the "BROADBAND/MANUAL" rotary switch to the "BROADBAND" position.

f. Depress the "FWD PWR" switch to the latched-in position.

g. Depress the "TUNE" switch to the latched-in position.

h. Adjust "OUTPUT" control for a 1.6 forward power meter indication.

i. Depress the "REV PWR" switch to the latched-in position and note the reverse power meter indication. If the indication is "0.2" (1 watt) or less for reverse power and "1.6" (25 watts) or more for forward power, proceed to step j. If the reverse power indication is higher than 0.2, omit step j and proceed to paragraph 2.4.3.2.

j. Depress the "FWD PWR" switch to the latched-in position and adjust the "OUTPUT" control for a 4.2 (150 watts) meter indication.

The Model CX7 can now be keyed for the desired transmission. Prior to changing to a new transmit frequency, perform the following:

1. Establish a receive mode.

2. Use the procedure recommended in paragraph 2.4.3.1b through i.

WARNING

Failure to comply with the previous steps 1 and 2 will result in damage to the Model CX7.

2.4.3.2 Operating with a VSWR Exceeding 1.5:1

a. Establish the receive mode.

b. Set the "BROADBAND/MANUAL" switch to the "MANUAL" position.

c. Depress the "TUNE" switch to the latched-in position.

d. Depress the "SCREEN" switch to the latched-in position.

e. Tune the power amplifier stage using the procedure covered in paragraph 2.4.2r.

f. Depress the "PTT" switch to the latched-in position thereby establishing the receive mode.

The Model CX7 can now be keyed for the desired transmission. Prior to changing to a new transmit frequency, perform the following:

1. Establish a receive mode.

2. Use the tuning procedure recommended in paragraph 2.4.2r.

WARNING

Failure to comply with the previous steps 1 and 2 will result in damage to the Model CX7.

2.4.4 Single Sideband Transmission

a. Perform the operations required for normal transmit channel operation as directed in paragraph 2.4.3.

b. Check that the microphone is connected.

c. Set the "MODE" selector to either the "LSB" or "USB" position as desired.

d. Key the transmitter in accordance with the applicable following paragraphs and conduct transmission as desired.

2.4.4.1 Manual Keying

a. To key the Model CX7 so that actual voice messages can be transmitted, perform either of the following:

1. Depress the "TRANSMIT" switch to the latched-in position.

2. Position the "PUSH-TO-TALK" switch located on the microphone to the "ON" or "TALK" position.

NOTE

Step 1 does not have to be performed if keying is accomplished using step 2.

2.4.4.2 VOX-ANTI-VOX Keying

a. Depress the "VOX" switch to the latched-in position.

b. Set the "VOX GAIN" control (on the rear panel) to the midrange position.

c. Set the "ANTI-TRIP" control (on the rear panel) to 1/4 from the full counterclockwise position.

d. Set the "PUSH-TO-TALK" switch located on the microphone to the "LISTEN" or "OFF" position (additional positioning of this switch is not required).

e. Refine the setting of the "ANTI-TRIP" control to the point just slightly more than the position that permits the Model CX7 to key on ambient noise or audio from the speaker.

f. Refine the setting of the "VOX GAIN" control to the point where the Model CX7 keys at normal voice levels.

NOTE

For best results, use the minimum settings of the "VOX" and "ANTI-VOX" controls as excessive gain in these circuits is not desirable.

g. Normal speech will now switch the Model CX7 from the receive mode to the transmit mode. If spoken end syllables are cut off by the transmitter unkeying, advance the setting of the rear panel "DELAY" control for an appropriate unkeying delay time.

2.4.4.3 Operation of "CLIPPING" Control

a. Depress the "CLIPPING" meter switch tc the latched-in position.

b. While conducting a voice transmission, slowly increase the setting of the "CLIPPING" control until the front panel meter registers from S-3 to S-4 during voice peaks. This setting provides approximately 10 DB of clipping causing a significant increase in TALK POWER under conditions of marginal signal to noise. Utilizing the clipping function increases the overall system gain which results in accentuation of background noise. For this reason, it is always desirable to use a minimum amount of clipping.

2.4.5 AM Transmission

a. Perform the operations required for normal transmit channel operation as directed in paragraph 2.4.3 except set the power output for 1.9 (35 watts).

b. Check that the microphone is connected.

c. Set the "MODE" selector to the "AM" position.

d. While conducting a voice transmission, adjust the "CLIPPING" control for a forward power indication of 2.8 (75 watts) during voice peaks.

2.4.6 CW Transmission

2.4.6.1 Normal Telegraph Key Operation

a. Depress the "PTT" switch to the latched-in position.

b. Set the "CLIPPING" control to the "0" position.

c. Set the "MODE" rotary selector to the "CW1" position.

NOTE

The "CW2" or "CW3" positions will interrupt the transmit signal path unless the optional CW filters have been installed.

d. Depressing the telegraph key automatically switches the Model CX7 from the receive to the transmit mode and causes excitation.

e. With the telegraph key depressed, adjust the rear panel "SIDETONE" control for the desired audio signal level. (This may be accomplished with or without power output present.)

f. Releasing the telegraph key automatically causes the Model CX7 to revert back to the receive mode.

2.4.6.2 Paddle Key Operation

a. Connect the paddle key to the applicable rear panel connector.

b. Follow the operating procedure for normal telegraph key operation covered in paragraph 2.4.6.1.

c. With the paddle set to either side position, adjust the "KEYER SPEED" control for the desired number of characters per minute. (This may be accomplished with or without power output present.)

NOTE

When operating at keyer speeds exceeding 25 words per minute, it is recommended that a fan be utilized with its air flow directed on the rear panel heat sink.

2.4.6.3 Offset Channel Operation

a. Normal channel operating procedures are also applicable when in the offset channel mode except the "VFO B" tuning control is not utilized. It is advantageous to use the offset channel mode whenever "VFO A" is being used in the receive mode.

b. Depress the "TRANSMIT VFO-A/T.O." switch to the latched-in position. The decimal point on the right hand Nixie tube illuminates as a visual indication that this mode is being used and has no significance in determining the frequency readout of the KHZ display.

c. Set the "TRANSMITTER OFFSET" (inner concentric control) a few degrees to the left or right of the midrange position.

d. Depress and hold in the "SPOT" pushbutton while adjusting the "SPOT LEVEL" control for a comfortable audio level.

e. While still in the receive mode and with the "SPOT" pushbutton held in, rotate the "TRANSMITTER OFFSET" control from the midrange position toward the right to increase the basic "VFO A" frequency for the transmit mode. If it is desired to offset to a lower frequency, rotate the control from the midrange position toward the left. It is possible to offset the frequency to be transmitted, by as much as 3 kHz, from the "VFO A" channel utilized by the receive mode. The actual amount of offset can only be determined by the audio frequency that is heard whenever the "SPOT" pushbutton is depressed. (This is very similar to spotting a separate CW transmitter and receiver except it is accomplished by the transceiver when in a receive mode.) The amount of offset tracks with the rotation of the "VFO A" tuning control.

CAUTION

It is possible to transmit outside the authorized band when operating near the band edge and subsequently offsetting in the wrong direction.

f. Release the "SPOT" pushbutton and key the transmitter using either the hand or paddle key.

2.4.7 FSK Mode

NOTE

1. FSK transmission is continuous duty operation therefore it is recommended that a fan be utilized with its air flow directed on the rear panel heat sink.

2. It may be necessary to reverse the teletypewriter signal leads to obtain the correct "MARK" and "SPACE" inversion.

a. Set the "MODE" rotary selector switch to the "FSK" position. (This position will interrupt the transmit signal path unless the optional FSK filter has been installed.)

b. Check that the external teletypewriter and FSK tone converter interconnections have been properly connected to the rear panel accessory plug.

c. Depress the "TRANSMIT VFO B" switch to the latched-in position.

d. Adjust the "VFO B" tuning control for the frequency indication of the desired nonshifted frequency.

e. Physically ground the external FSK keyline at the appropriate teletypewriter output terminal.

f. Adjust the front panel "FSK SHIFT" control for the frequency indication on the "MHZ" display for the desired shifted frequency.

g. Remove the ground from the FSK keyline.

h. Tune up the power amplifier stage using "VFO A" tuned to the frequency midrange between the shift in accordance with the recommended procedure in paragraph 2.4.3 and then switch the transmit VFO back to the "B" channel.

i. Proceed with operations as follows:

1. Prior to transmitting from the teletypewriter, depress the "TRANSMIT" switch to the latched-in position.

2. Prior to receiving, depress the "PTT" switch to the latched-in position.

2.4.8 Linear Amplifier Operation. When operating with a linear amplifier, special precautions must be followed when keying the transmitter. The Model CX7 possesses extremely fast T/R keying characteristics that cannot be equaled by linear amplifiers. Consequently, the Model CX7 would be temporarily unloaded, with power output present, during the time a linear amplifier is switching from a receive to a transmit mode.

WARNING

Failure to use manual keying, when the Model CX7 is driving a linear amplifier, will result in damage to the Model CX7. Allow sufficient time for the linear amplifier to switch modes before exciting the Model CX7.

OPERATION
AND
MAINTENANCE
MANUAL

MODEL CX7/CX7A

DELUXE
INTEGRATED STATION

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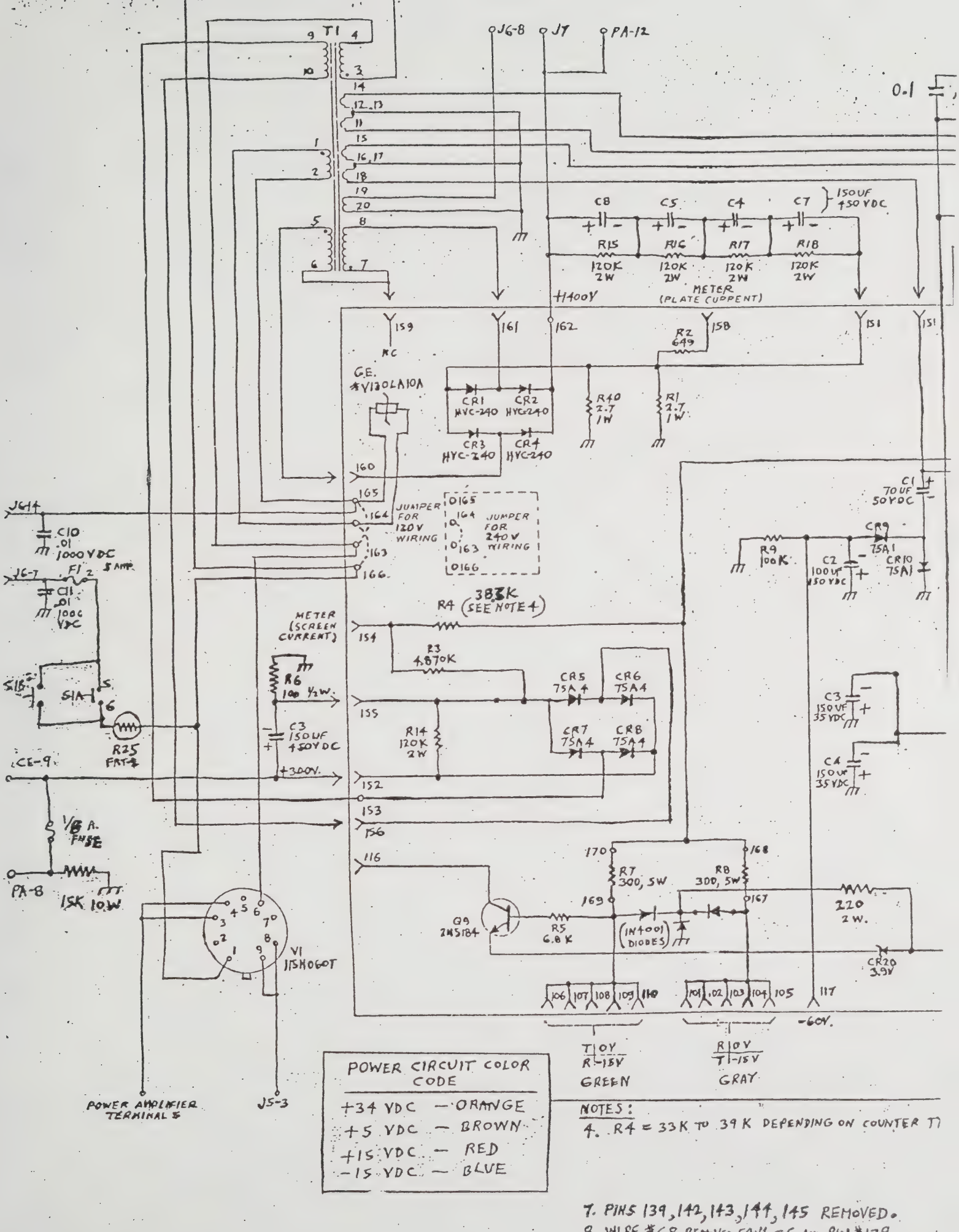

POWER CIRCUIT COLOR CODE	
+34 VDC	— ORANGE
+5 VDC	— BROWN
+15 VDC	— RED
-15 VDC	— BLUE

NOTES:

4. R4 = 33K TO 39K DEPENDING ON COUNTER TI

7. PINS 139, 142, 143, 144, 145 REMOVED.

8. WIRE #68 REMOVED FROM C6 AND PIN #139.

POWER CIRCUIT COLOR CODE	
+34 VDC	— ORANGE
+5 VDC	— BROWN
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NOTES:

4. R4 = 33K TO 39K DEPENDING ON COUNTER TT

7. PINS 139, 142, 143, 144, 145 REMOVED.
8. WIRE #68 REMOVED FROM C6 AND PIN #139.

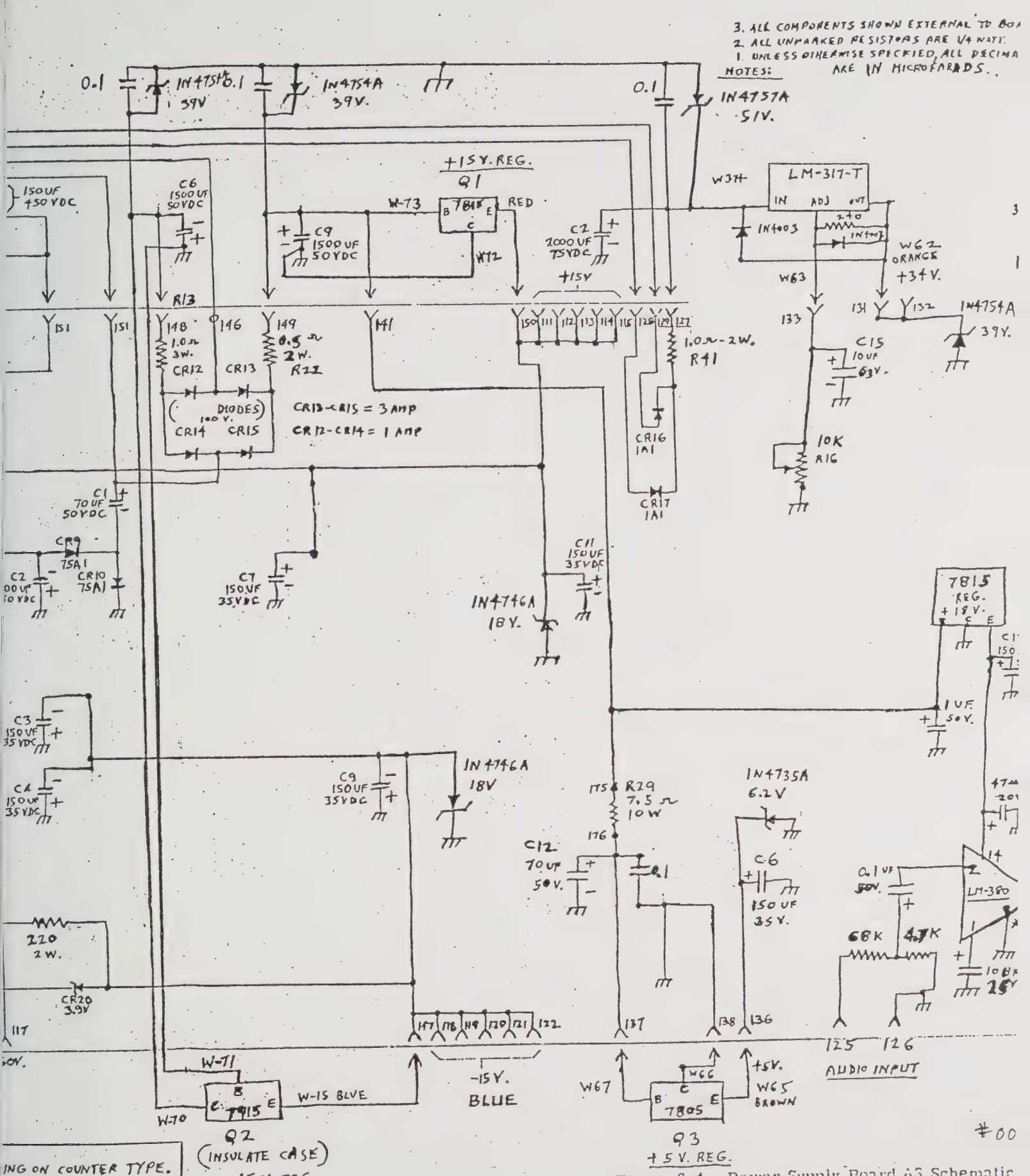

Figure 6-4. Power Supply Board A3 Schematic

ING ON COUNTER TYPE.

REMOVED.
ND PIN #139.

9. WIRES 70, 71, 72, 73 RUN DIRECT TO C6 OR C9.

13. REMOVE WIRE #64 FROM C-2 AND RE
FOR LM-317T MOD. ONLY.

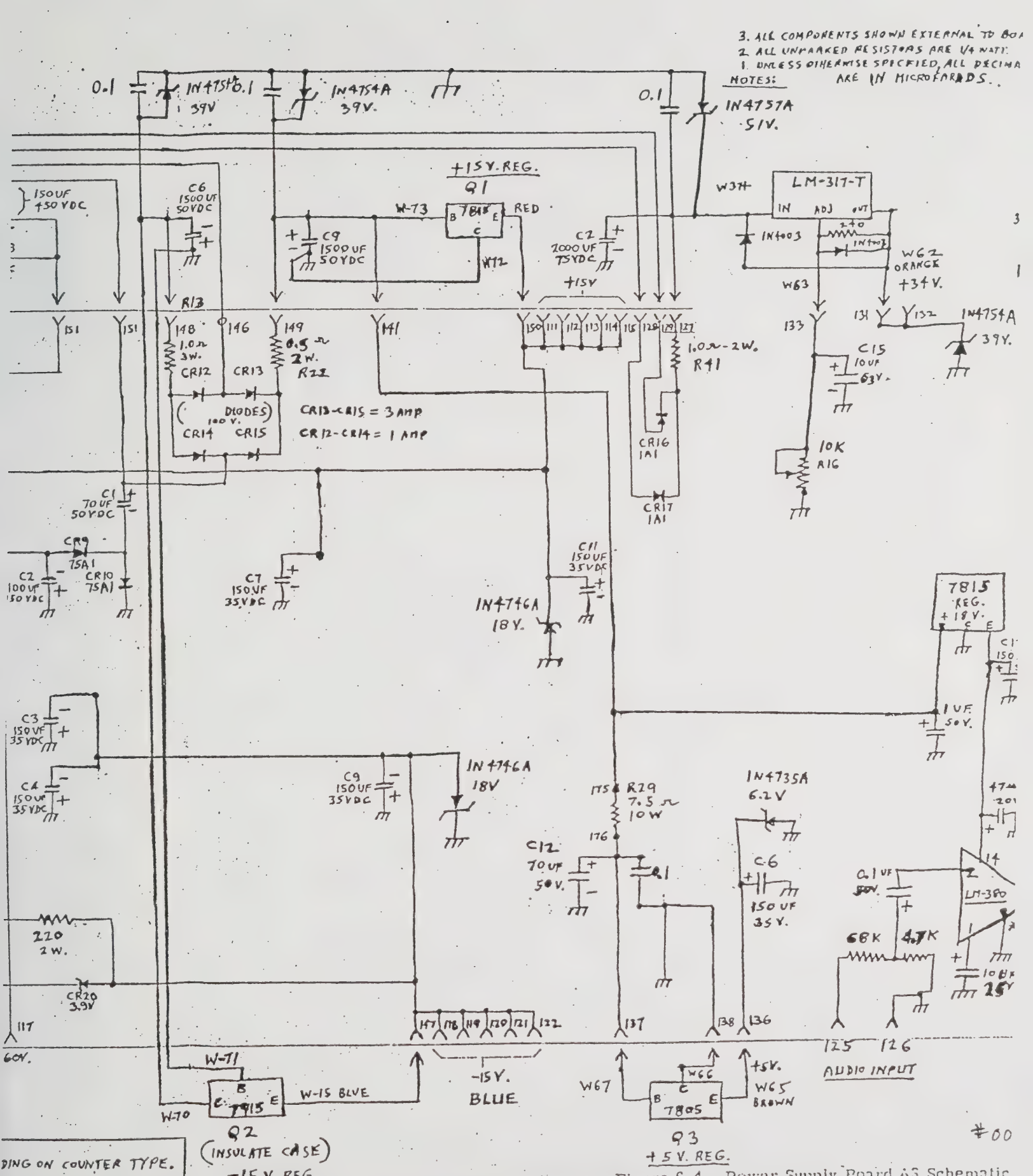

Figure 6-4. Power Supply Board A3 Schematic

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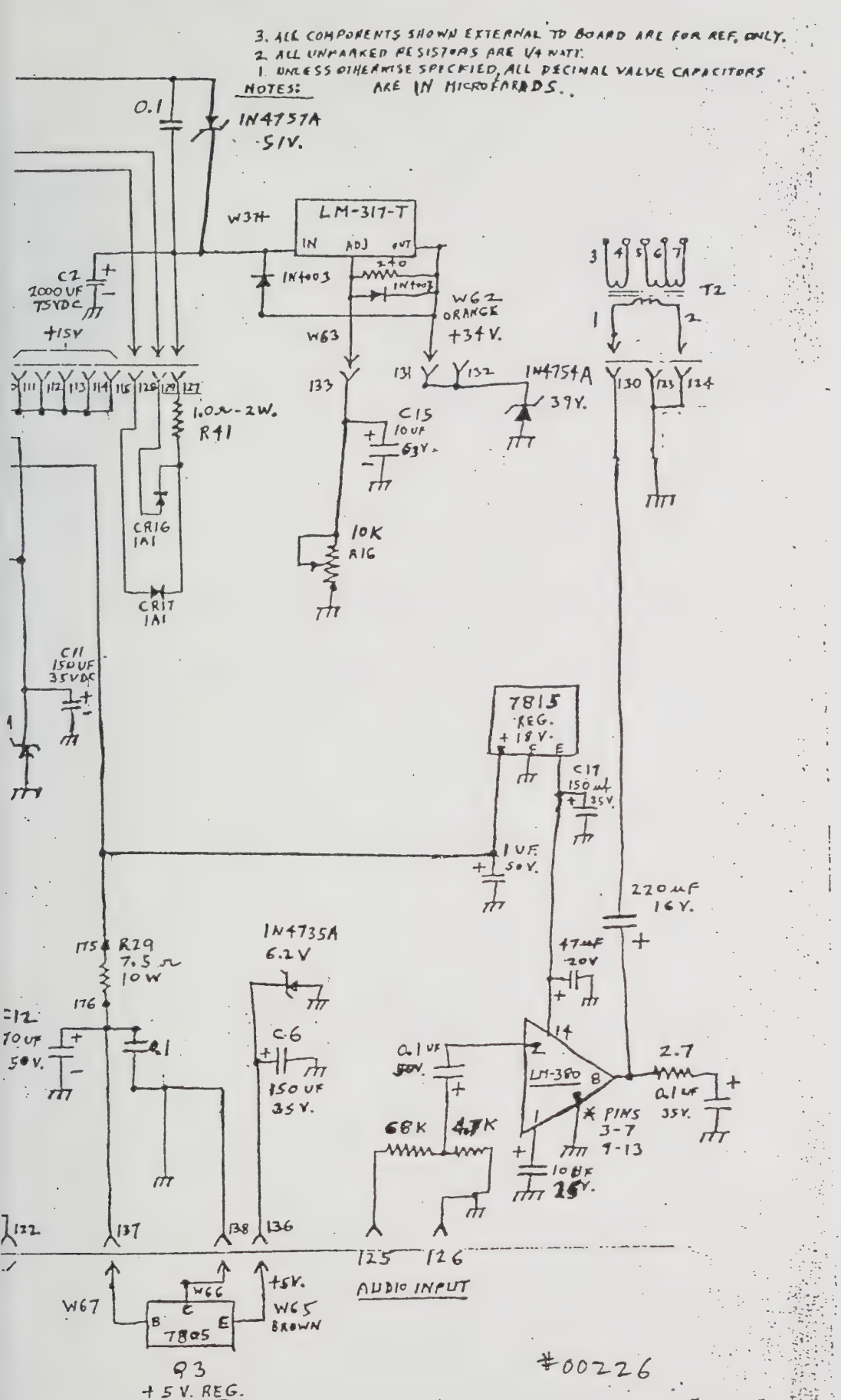

Figure 6-4. Power Supply Board A3 Schematic Diagram (REVISED WBCX5)

C6 OR C9.

13. REMOVE WIRE #64 FROM C-2 AND REMOVE PIN #135 FOR LM-317T MOD. ONLY.

NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL DECIMAL VALUE CAPACITORS ARE IN MICROFARADS.
2. ALL UNMARKED RESISTORS ARE 1/4 WATT.
3. ALL COMPONENTS SHOWN EXTERNAL TO BOARD ARE FOR REF. ONLY.

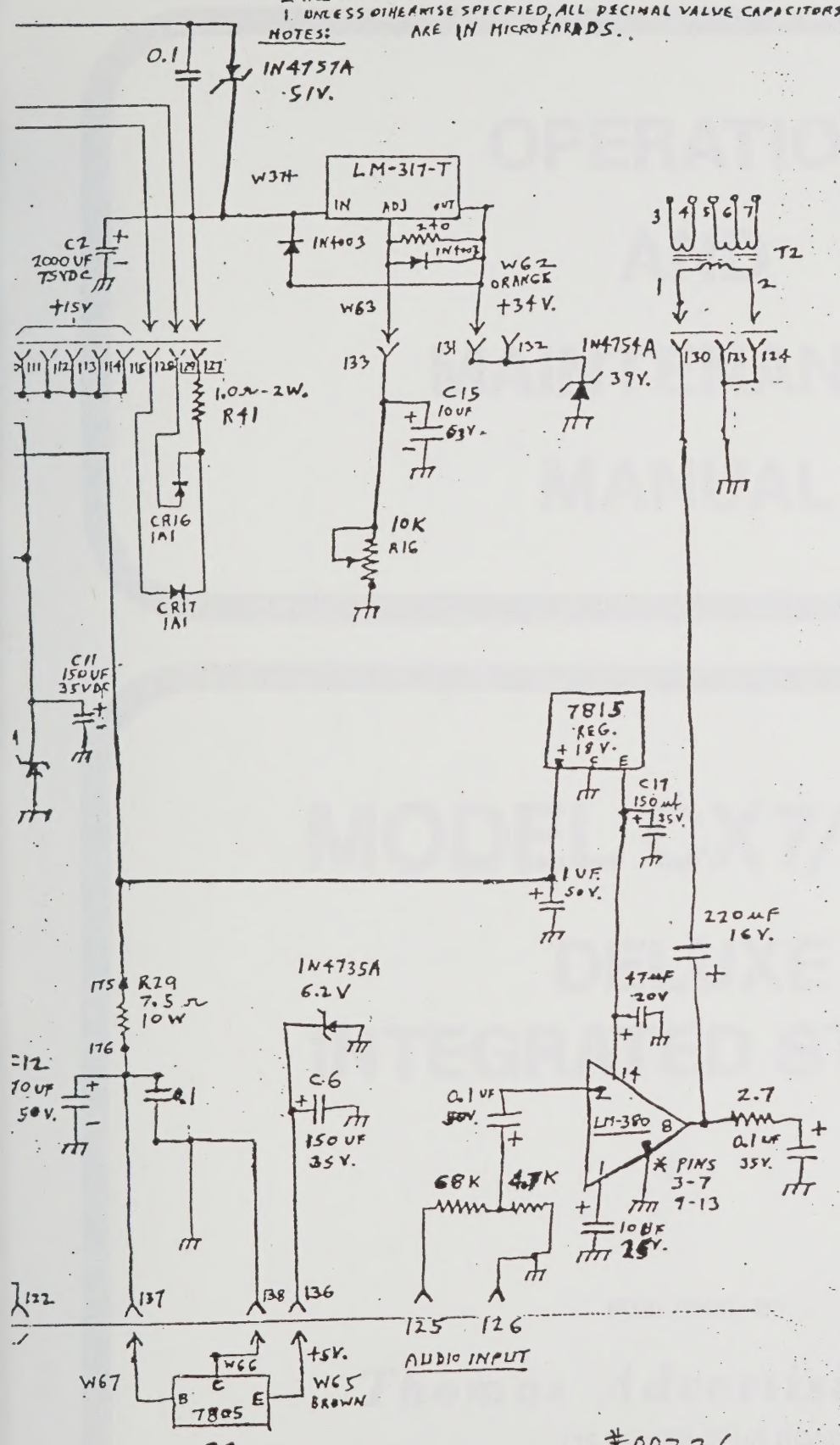

Figure 6-4. Power Supply Board A3 Schematic Diagram (REVISED W8CXS)

C6 OR C9.

13. REMOVE WIRE #64 FROM C-2 AND REMOVE PIN #135 FOR LM-317T MOD. ONLY.

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